E-6

<length>	::=	<word16>	{ Number of bytes of data in packet. }
<nak>	::=	15_H	
<packet>	::=	<stp> <reserved> <ctrl> <seq_nbr> <length> <data> <crc>	
<reserved>	::=	<byte>	{ This field reserved for manufacturer or utility use. Value of the byte should be zero (00_H) if the field is not used. }
<seq_nbr>	::=	<byte>	{Number that is decremented by one for each new packet sent. The first packet in a multiple packet transmission shall have a <seq_nbr> equal to the total number of packets minus one. A value of zero in this field indicates that this packet is the last packet of a multiple packet transmission.}
<stp>	::=	EE_H	{ Start of packet character. }

ANNEX B
(Informative)
Communication example (layer 7 and layer 2)

Figures B-1 and B-2 show an example of a communications session between a handheld and a meter in which a table is read. Annex C, figure C-1 shows the actual packet data transmission of this example.

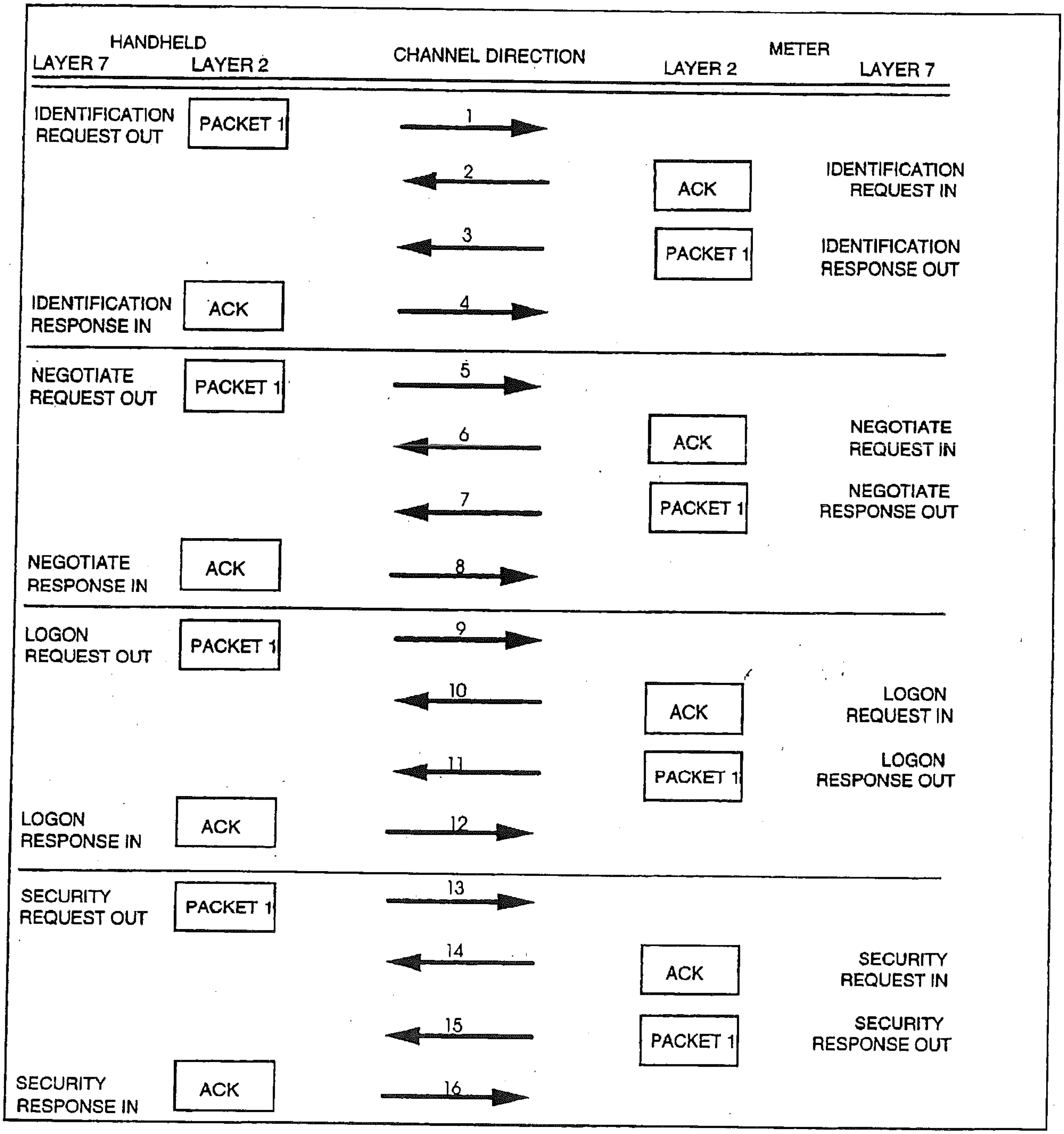


Figure B-1–Communication example

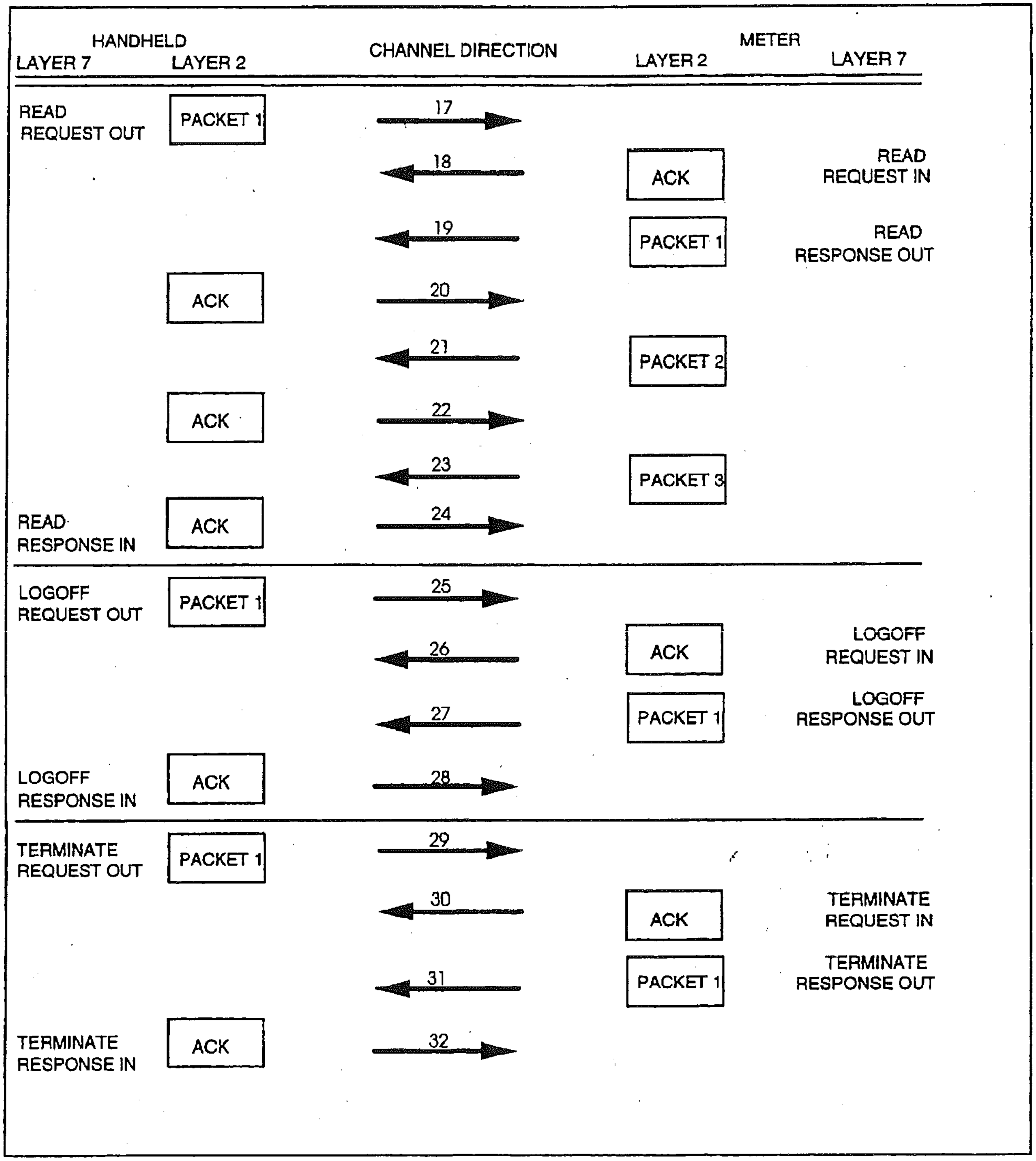


Figure B-2–Communication example continued

ANNEX C
(Informative)
Packet transmission example

Figure C-1 shows the actual packet data being transmitted in figures B-1 and B-2 in Annex B. Numbers 1)–32) refer to the numbers in figures B-1 and B-2. All values are specified in hexadecimal format. The following arbitrary information was used.

<std>	=	00
<ver>	=	01
<rev>	=	00
<packet_size>	=	0040 (64 bytes)
<nbr_packet>	=	04 (4 packets)
<baud_rate>	=	08 (19200 baud)
<user_id>	=	1111
<username>	=	01 02 03 04 05 06 07 08 09 0A
<password>	=	01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14
<table_id>	=	0000
<offset>	=	000010
<count>	=	0096 (150 bytes)
<data>	=	01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F 10 11 12 13 14 15 16 17 18 19 1A 1B 1C 1D 1E 1F 20 21 22 23 24 25 26 27 28 29 2A 2B 2C 2D 2E 2F 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 4A 4B 4C 4D 4E 4F 50 51 52 53 54 55 56 57 58 59 5A 5B 5C 5D 5E 5F 60 61 62 63 64 65 66 67 68 69 6A 6B 6C 6D 6E 6F 70 71 72 73 74 75 76 77 78 79 7A 7B 7C 7D 7E 7F 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96

1) → EE 00 00 00 0001 20 13 10
2) ← 06
3) ← EE 00 00 00 0005 00 00 01 00 00 C6 B5
4) → 06
5) → EE 00 20 00 0005 61 0040 04 08 8A 5F
6) ← 06
7) ← EE 00 20 00 0005 00 0040 04 08 7D F5
8) → 06
9) → EE 00 00 00 000D 50 1111 0102030405060708090A CA 33
10) ← 06
11) ← EE 00 00 00 0001 00 11 31
12) → 06
13) → EE 00 20 00 0015 51 0102030405060708090A0B0C0D0E0F1011121314 86 27
14) ← 06
15) ← EE 00 20 00 0001 00 80 51
16) → 06
17) → EE 00 00 00 0008 3F 0000 000010 0096 B0 7F
18) ← 06
19) ← EE 00 C0 02 0038 00 0096 0102030405060708090A0B0C0D0E0F1011121314151617
18191A1B1C1D1E1F202122232425262728292A2B2C2D2E2F303132333435 BA 8E
20) → 06
21) ← EE 00 A0 01 0038 363738393A3B3C3D3E3F404142434445464748494A4B4C4D4E4F50
5152535455565758595A5B5C5D5E5F606162636465666768696A6B6C6D F0 47
22) → 06
23) ← EE 00 80 00 002A 6E6F707172737475767778797A7B7C7D7E7F808182838485 86
8788898A8B8C8D8E8F90919293949596 C3 BD B1
24) → 06
25) → EE 00 20 00 0001 52 17 20
26) ← 06
27) ← EE 00 20 00 0001 00 80 51
28) → 06
29) → EE 00 00 00 0001 21 9A 01
30) ← 06
31) ← EE 00 00 00 0001 00 11 31
32) → 06

Figure C-1–Packet transmission example

ANNEX D
(Informative)
Service sequence state control

The period of PSEM communications is defined in a series of "Service Sequence States." The use of each service may be restricted to one or more states. Specific services also cause transitions between states. The transition is implemented upon positive acknowledgement of the service. The recognized states include:

a) Base State—This is the state at which communication begins. At this point the default data transmission parameters apply.

b) ID State—Once the metering device has been identified, this is the state that is entered.

c) Session State—When a successful logon has been completed, this is the state achieved.

The relationship between PSEM services and service sequence states is:

Identification service requests are accepted at the base state only. Acceptance of an identification service request, <ok> transitions communications to the ID state. This service cannot originate from the metering device.

Wait service requests are accepted in the ID and session states. Acceptance of these requests do not result in any sequence state changes. This service can originate from either end of the communication channel.

Negotiate service requests are accepted in the ID state only. Acceptance of these requests do not result in any sequence state changes. Negotiated services are not implemented until after acceptance. This service cannot originate from the metering device.

Logon service requests are accepted at the ID state only. Acceptance of a logon service request, <ok> transitions communications to the session state. This service cannot originate from the metering device.

Security service requests are accepted at the session state only. Acceptance of these requests do not result in any sequence state changes. This service cannot originate from the metering device.

Read and write service requests are accepted in the session state only. Acceptance of these requests do not result in any sequence state changes. These services can originate from either end of the communication channel.

Logoff service requests are accepted at the session state only. Acceptance of a logoff service request, <ok> transitions communications to the ID state. This service can originate from either end of the communication channel.

Terminate service requests are accepted at the ID and session states. Acceptance of a terminate service request, <ok> transitions communications to the base state. This service can originate from either end of the communication channel.

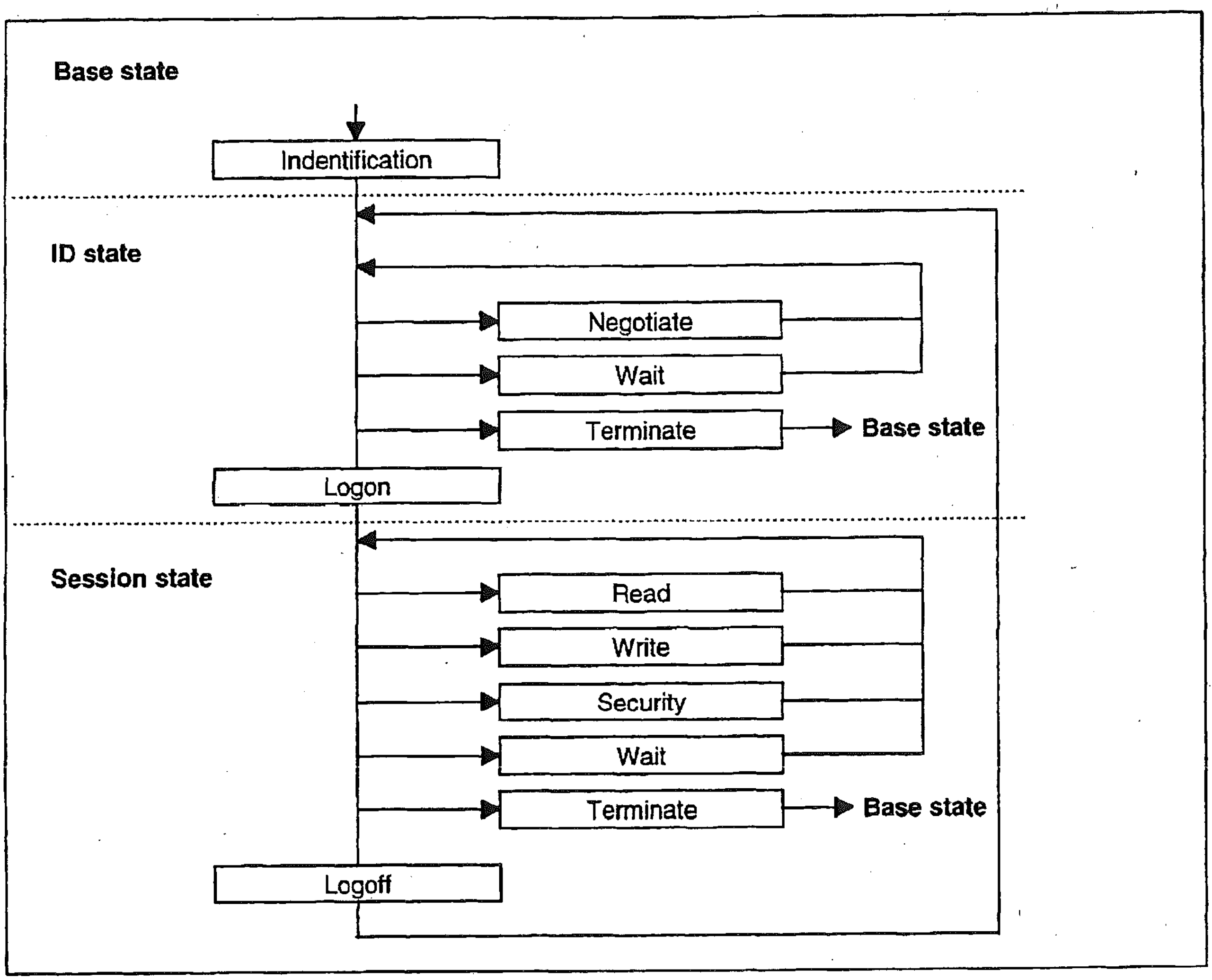


Figure D-1–Communication state diagram

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
1300 NORTH 17TH STREET, SUITE 900 • ROSSLYN, VA 22209
www.NEMA.org

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The Kahn reference, Kahn, Robert E., "Advances in Packet Radio Technology," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978) (Kahn 1978), includes descriptions relating to station and station-less routing in a packet radio network.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Kahn 1978
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
received from said second network that are destined for said first network to said first network,	communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery,

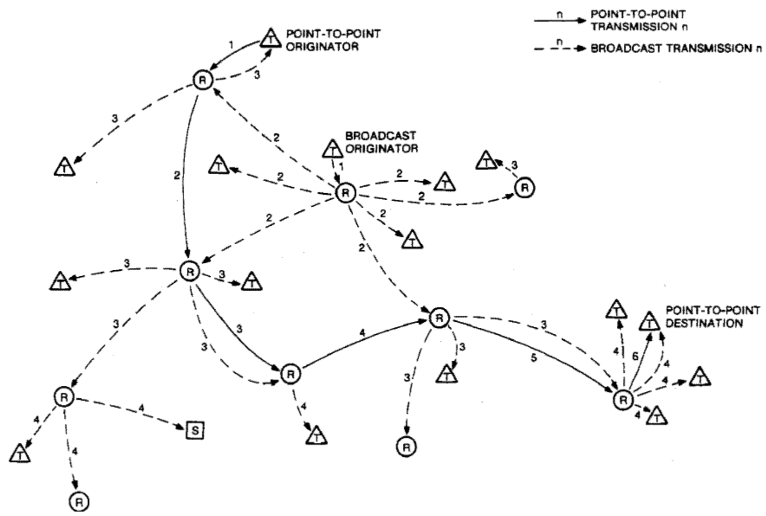
The '516 Patent – Claims	Kahn 1978
	changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and

The '516 Patent – Claims	Kahn 1978
	writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
	links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
	1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In

The '516 Patent – Claims	Kahn 1978
path of a client of said first network to said server can be through one or more of other clients of said first network;	particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the

The '516 Patent – Claims	Kahn 1978
gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
	1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on

The '516 Patent – Claims	Kahn 1978
	the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496. Kahn's stations have a gateway functions to a point-to-point network, such as the internet, which would inherently involve the TCP/IP protocol, and Kahn cites to the Cerf and Kahn IEEE article defining TCP. At a minimum, it would have been obvious to use TCP/IP in the point-to-point protocol network in order to provide a well-known and reliable protocol.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet

The '516 Patent – Claims	Kahn 1978
	operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496.
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

The '516 Patent – Claims	Kahn 1978
network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on

The '516 Patent – Claims	Kahn 1978
	the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496. Kahn's stations have a gateway functions to a point-to-point network, such as the Internet, which would inherently involve the TCP/IP protocol, and Kahn cites to the Cerf and Kahn IEEE article defining TCP. At a minimum, it would have been obvious to use TCP/IP in the point-to-point protocol network in order to provide a well-known and reliable protocol. It also would have been obvious to include a packet type to packets received by the

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	gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished

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	using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477.

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	"As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table

The '516 Patent – Claims	Kahn 1978
	information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network.

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	One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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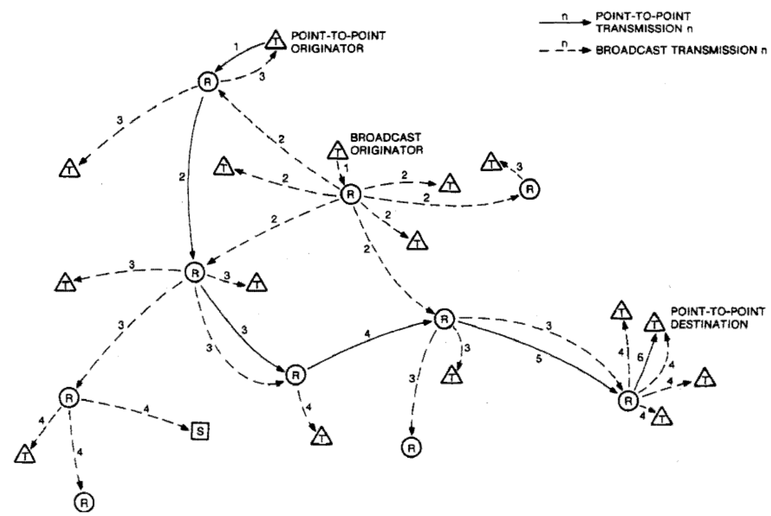
	received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing. At a minimum, it also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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	reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point

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	route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may

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	be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed

The '516 Patent – Claims	Kahn 1978
	to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494.

The '516 Patent – Claims	Kahn 1978
	"[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496. Kahn's stations have a gateway functions to a point-to-point network, such as the Internet, which would inherently involve the TCP/IP protocol, and Kahn cites to the Cerf and Kahn IEEE article defining TCP. At a minimum, it would have been obvious to use TCP/IP in the point-to-point protocol network in order to provide a well-known and reliable protocol.
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978

The '516 Patent – Claims	Kahn 1978
	at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known

The '516 Patent – Claims	Kahn 1978
	as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '516 Patent – Claims	Kahn 1978
	Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	Kahn 1978
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which

The '314 Patent – Claims	Kahn 1978
	consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '314 Patent – Claims	Kahn 1978
	"A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A

The '314 Patent – Claims	Kahn 1978
	route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For

The '314 Patent – Claims	Kahn 1978
	example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

<table>
<tr><th>The '314 Patent – Claims</th><th>Kahn 1978</th></tr>
<tr><td></td><td>reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492.

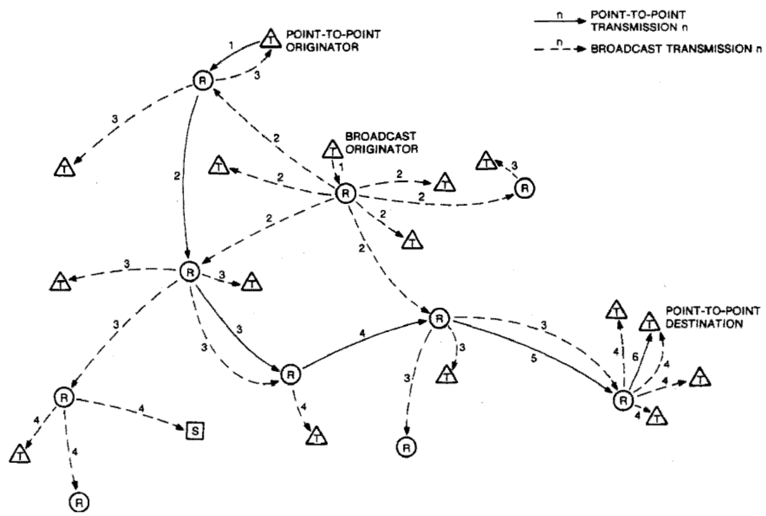
Kahn 1978 at 1480 (Fig. 9):


Fig. 9. Point-to-point and broadcast routing.</td></tr>
<tr><td>wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and</td><td>"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station</td></tr>
</table>

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '314 Patent – Claims	Kahn 1978
	then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

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	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other

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	stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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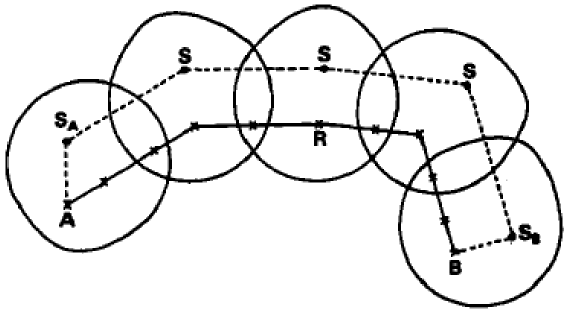
	discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

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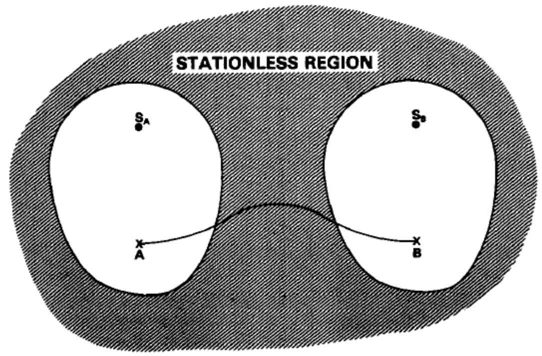
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '314 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

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	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

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a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate

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	(transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

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	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

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The '314 Patent – Claims	Kahn 1978
	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a

The '314 Patent – Claims	Kahn 1978
	nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	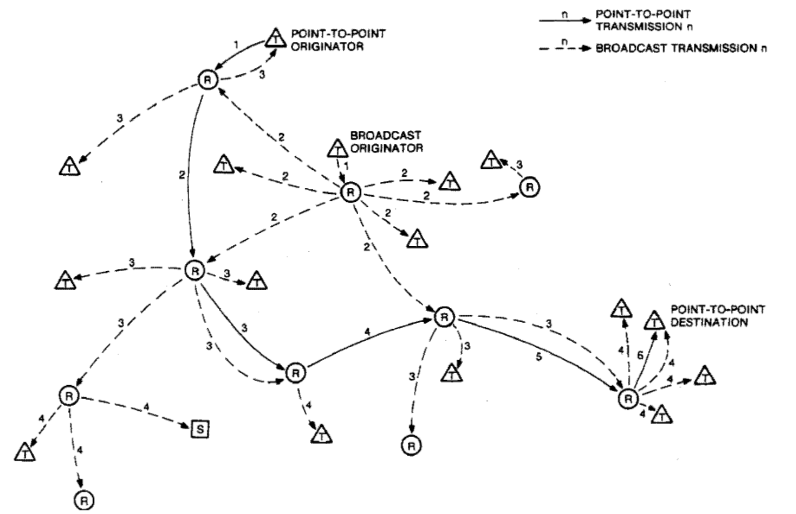 Fig. 9. Point-to-point and broadcast routing.
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

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the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in

The '314 Patent – Claims	Kahn 1978
	some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising:	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The

The '314 Patent – Claims	Kahn 1978
a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '314 Patent – Claims	Kahn 1978
	"The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a

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	renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery,

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	changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A

The '314 Patent – Claims	Kahn 1978
	user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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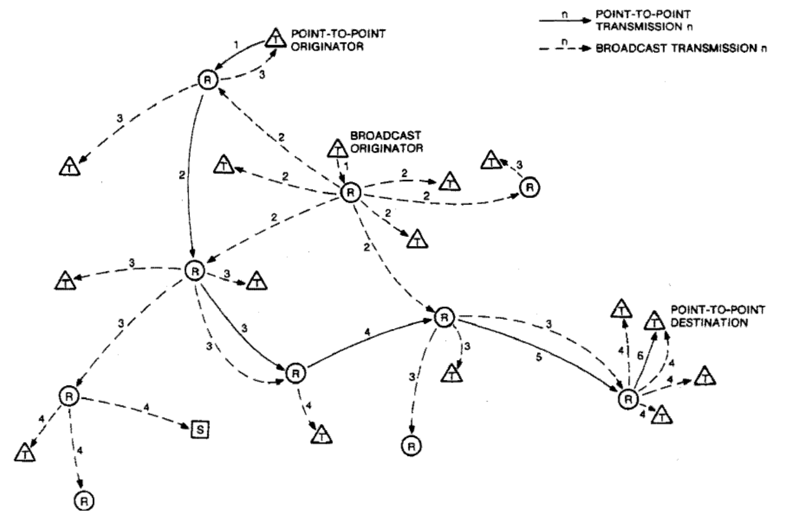
<table>
<tr><th>The '314 Patent – Claims</th><th>Kahn 1978</th></tr>
<tr><td></td><td>

Fig. 9. Point-to-point and broadcast routing.</td></tr>
<tr><td>selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;</td><td>"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.</td></tr>
</table>

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The '314 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

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	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

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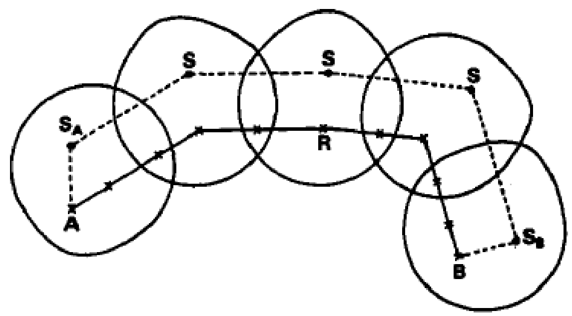
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

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The '314 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

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	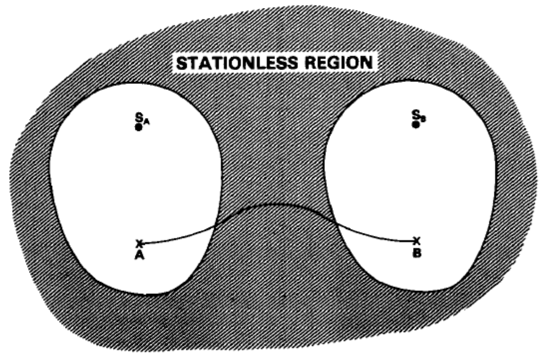 Fig. 11. Communication across a stationless region.
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

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	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

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	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

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communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate

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	(transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

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	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

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	nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	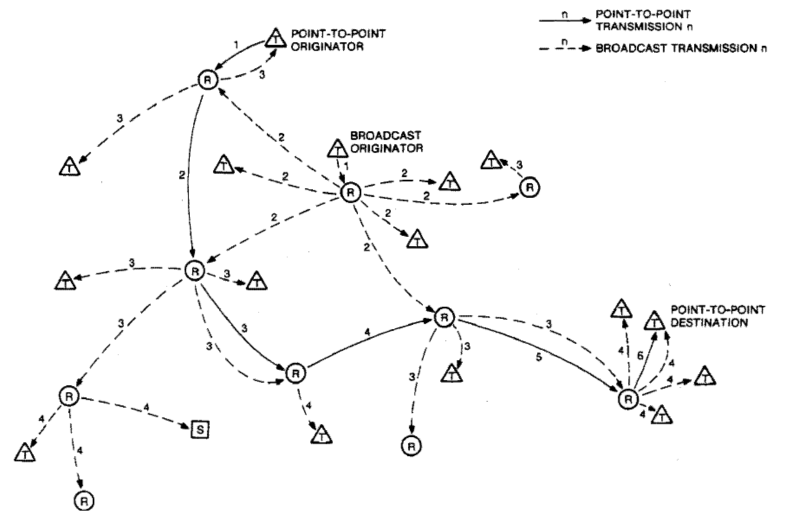 Fig. 9. Point-to-point and broadcast routing.
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

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	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first second nodes, the path to the first node through the most robust additional second nodes, the path to	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or

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the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '314 Patent – Claims	Kahn 1978
	"3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494.

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	"[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure

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	the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496.
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network

The '314 Patent – Claims	Kahn 1978
network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed

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	to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream

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	repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '314 Patent – Claims	Kahn 1978
	[24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the

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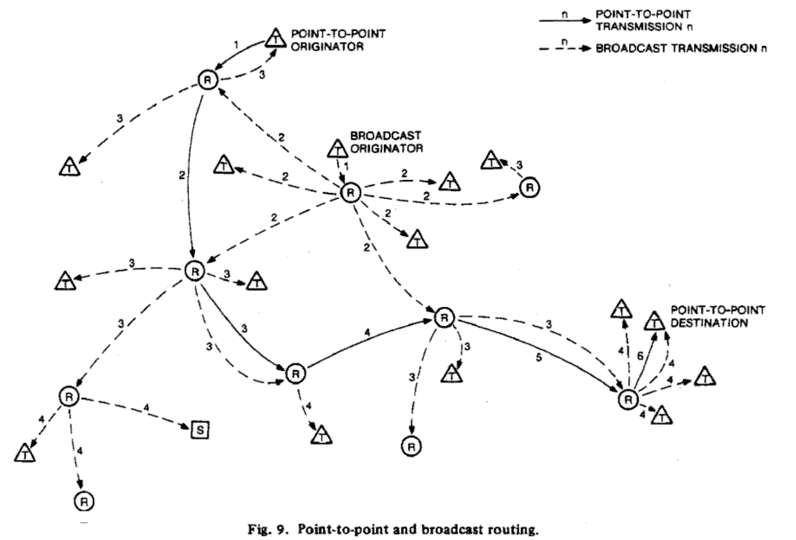
	packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '314 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

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the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in

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	some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

Invalidity Chart for U.S. Patent No. 8,233,471

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2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which

The '471 Patent – Claims	Kahn 1978
	consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '471 Patent – Claims	Kahn 1978
	"A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A

The '471 Patent – Claims	Kahn 1978
	route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For

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	example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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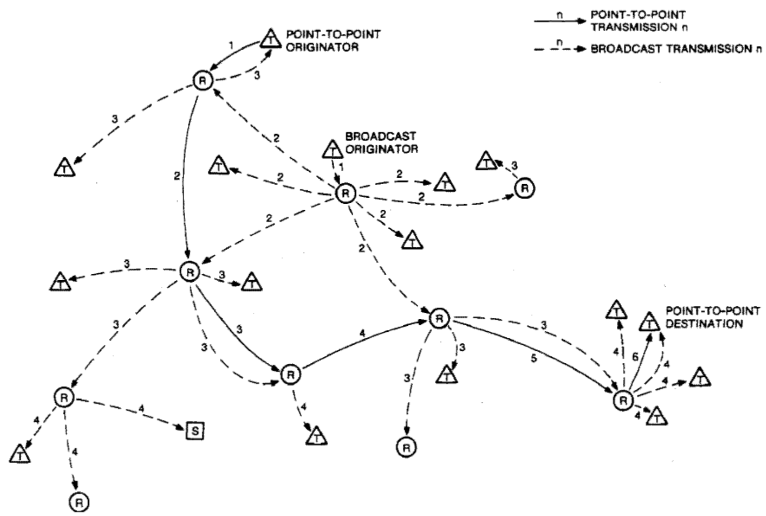
	reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station

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	then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

The '471 Patent – Claims	Kahn 1978
	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other

The '471 Patent – Claims	Kahn 1978
	stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be

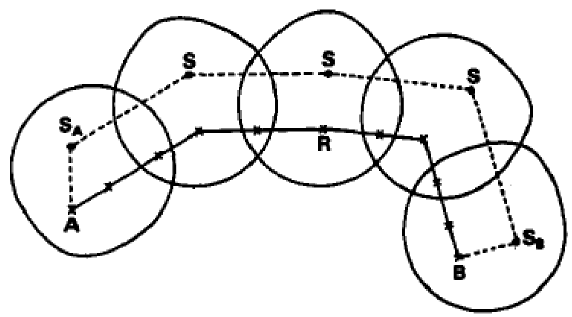
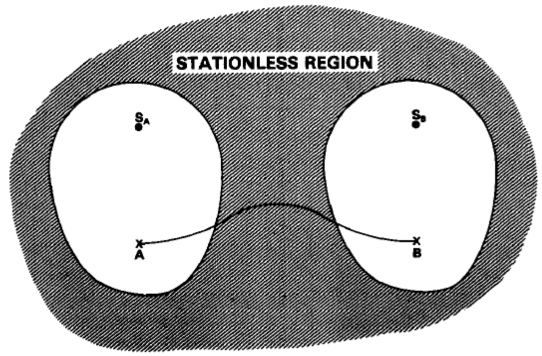
The '471 Patent – Claims	Kahn 1978
	discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

The '471 Patent – Claims	**Kahn 1978**
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to

The '471 Patent – Claims	Kahn 1978
	each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as

The '471 Patent – Claims	Kahn 1978
	their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

The '471 Patent – Claims	Kahn 1978
	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

The '471 Patent – Claims	Kahn 1978
	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

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	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
4. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network

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buffer in digital memory, and	routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed

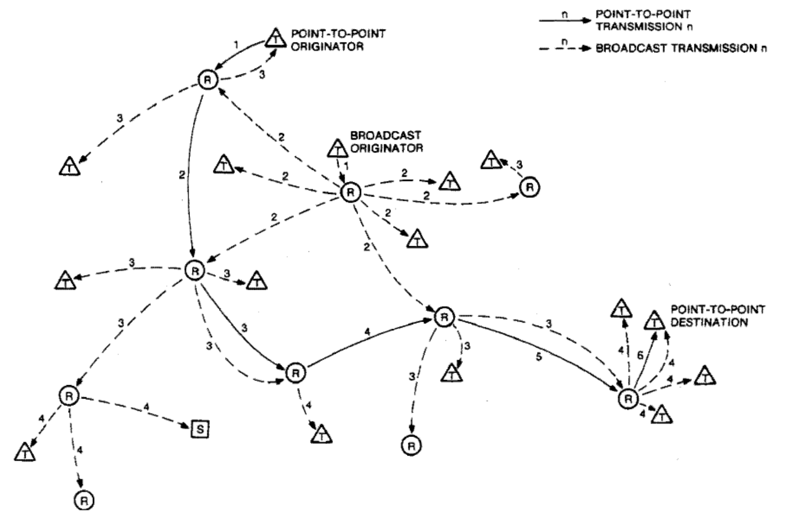
The '471 Patent – Claims	Kahn 1978
	to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream

The '471 Patent – Claims	Kahn 1978
	repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net

The '471 Patent – Claims	Kahn 1978
	[24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the

The '471 Patent – Claims	Kahn 1978
	packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

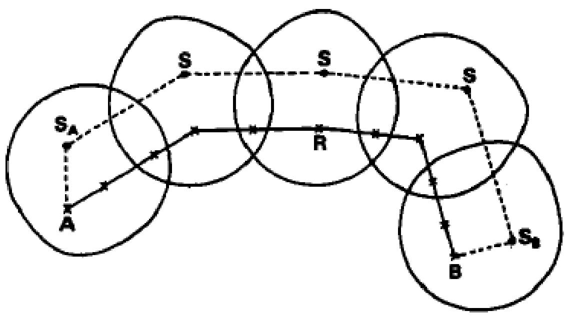
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

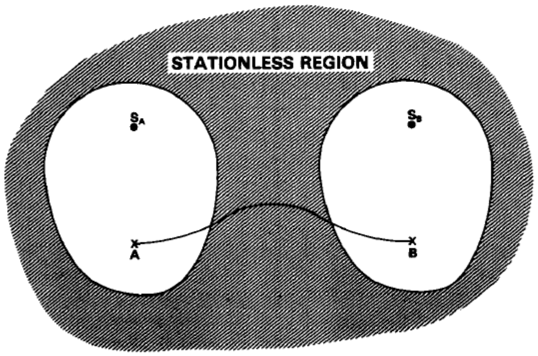
The '471 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '471 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '471 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

The '471 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to

The '471 Patent – Claims	Kahn 1978
	each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as

The '471 Patent – Claims	Kahn 1978
	their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the

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	header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to:	It would have been obvious to implement authentication of clients and maintenance of a client link tree.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	"With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

The '471 Patent – Claims	Kahn 1978
	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

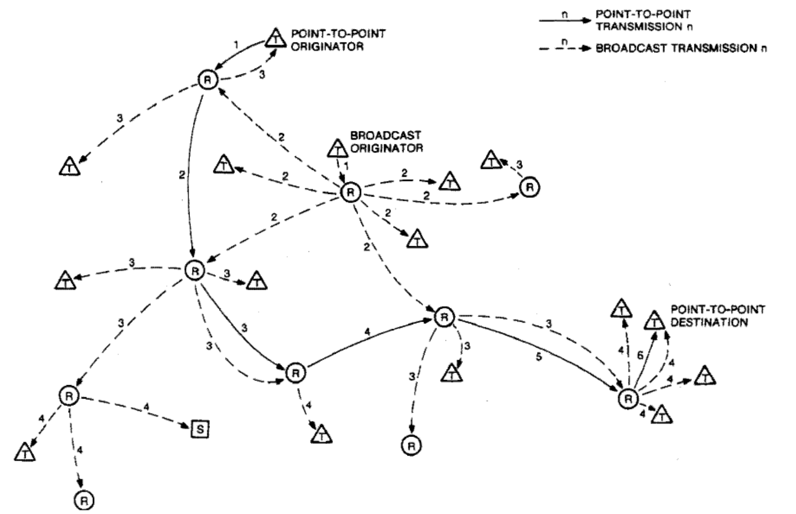
The '471 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

The '471 Patent – Claims	Kahn 1978
	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net

The '471 Patent – Claims	Kahn 1978
	and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may

The '471 Patent – Claims	**Kahn 1978**
	actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '471 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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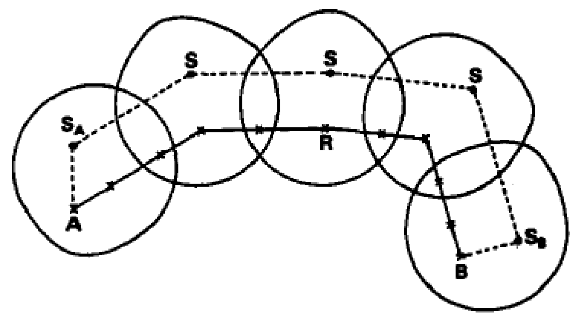
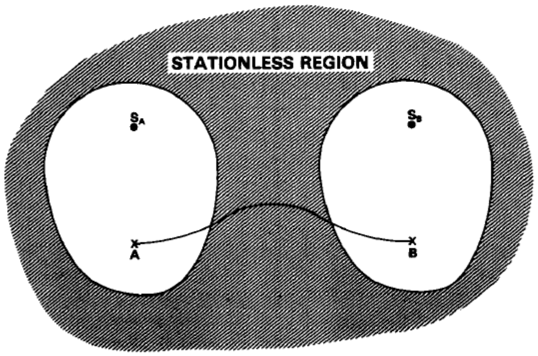
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '471 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

The '471 Patent – Claims	Kahn 1978
	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

The '471 Patent – Claims	Kahn 1978
	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

The '471 Patent – Claims	Kahn 1978
	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
12. A method as recited in claim 11,	It would have been obvious to implement authentication of clients and maintenance

The '471 Patent – Claims	Kahn 1978
wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network

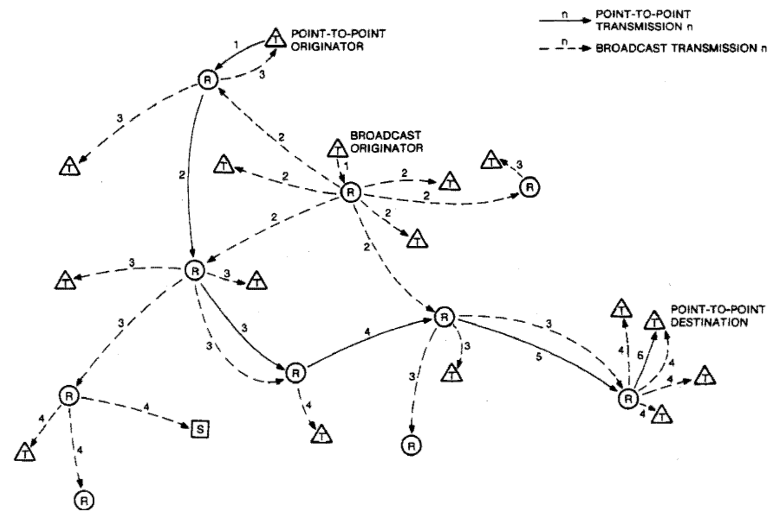
The '471 Patent – Claims	Kahn 1978
	routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed

The '471 Patent – Claims	Kahn 1978
	to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream

The '471 Patent – Claims	Kahn 1978
	repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net

The '471 Patent – Claims	Kahn 1978
	[24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the

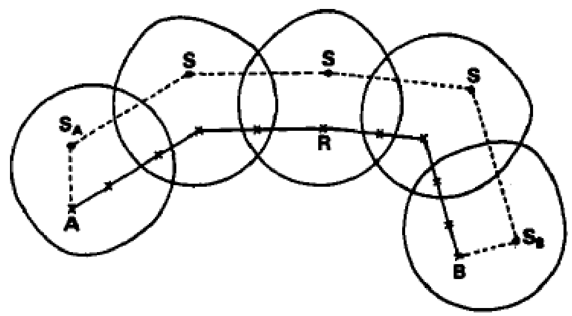
The '471 Patent – Claims	Kahn 1978
	packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

The '471 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '471 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '471 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '471 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

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	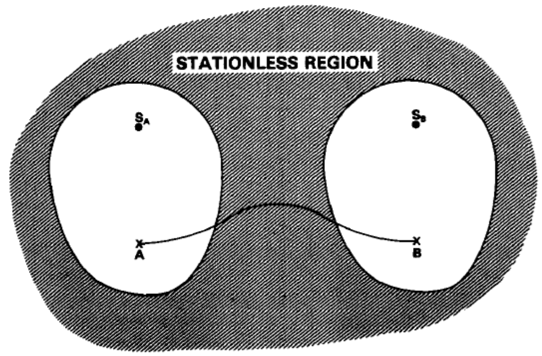 Fig. 11. Communication across a stationless region.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to

The '471 Patent – Claims	Kahn 1978
	each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as

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	their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the

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	header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
16. A method as recited in claim 15, wherein said server process further comprises steps of:	It would have been obvious to implement authentication of clients and maintenance of a client link tree.

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determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	"With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

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process including receiving and transmitting data packets via said second node radio modem,	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

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	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

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	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net

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	and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may

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	actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

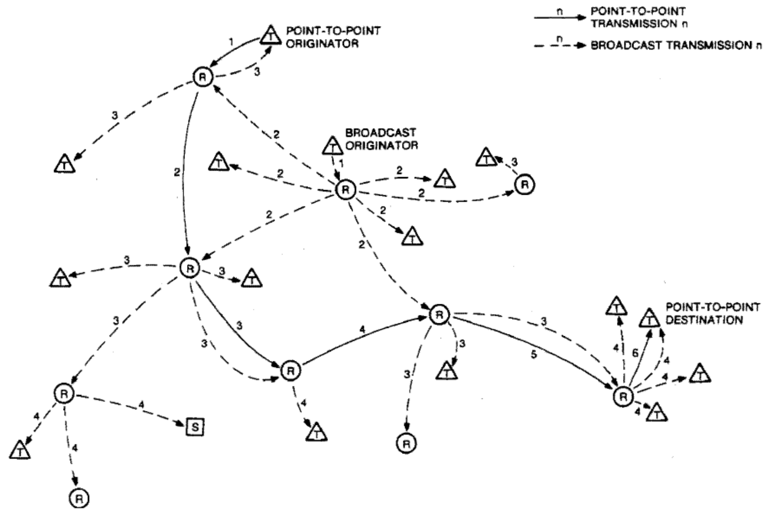
<table>
<tr><th>The ‘471 Patent – Claims</th><th>Kahn 1978</th></tr>
<tr><td></td><td>

Fig. 9. Point-to-point and broadcast routing.</td></tr>
<tr><td>wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and</td><td>“A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary.” Kahn 1978 at 1477.</td></tr>
</table>

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	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

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	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

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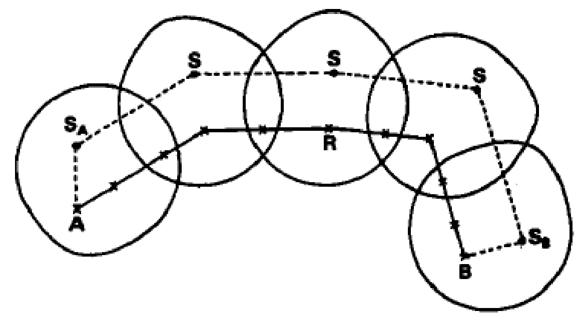
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

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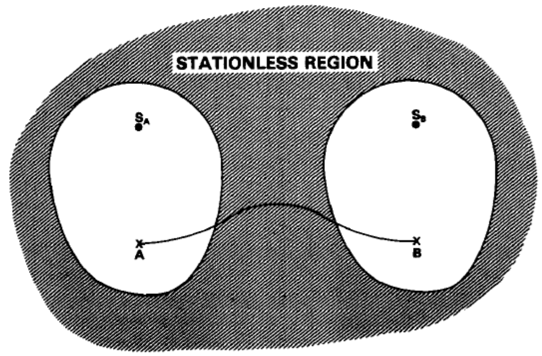
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

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	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

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	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

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conditions.	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
19. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

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recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a

The '471 Patent – Claims	Kahn 1978
receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way

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	that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are

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	rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by

The '471 Patent – Claims	Kahn 1978
	the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is

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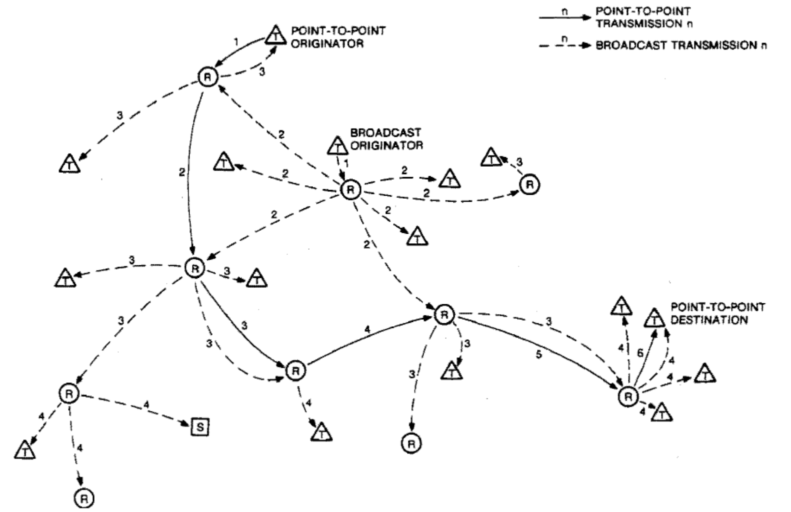
	input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

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	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

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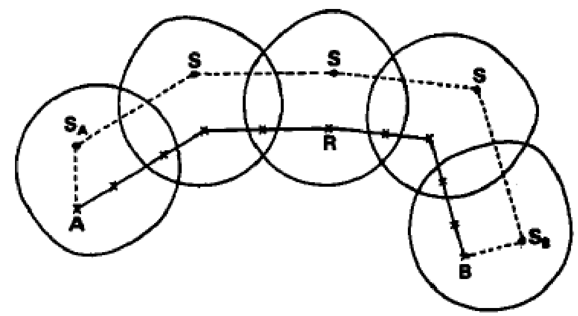
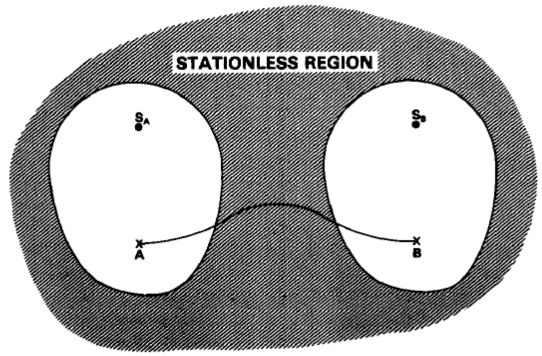
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

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	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

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	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

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	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
22. A wireless system as recited in	It would have been obvious to implement authentication of clients and maintenance

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are

The '471 Patent – Claims	Kahn 1978
second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as

The '471 Patent – Claims	Kahn 1978
	a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path.

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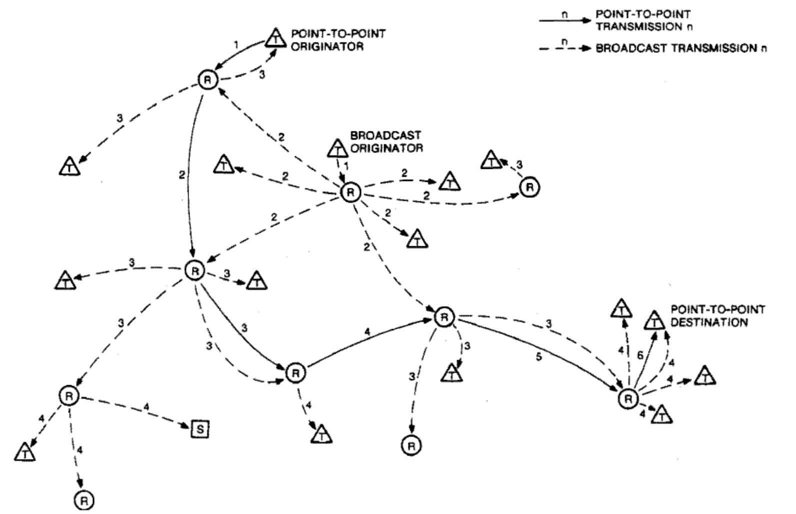
	To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80.

The '471 Patent – Claims	Kahn 1978
	"As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '471 Patent – Claims	Kahn 1978
	"Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

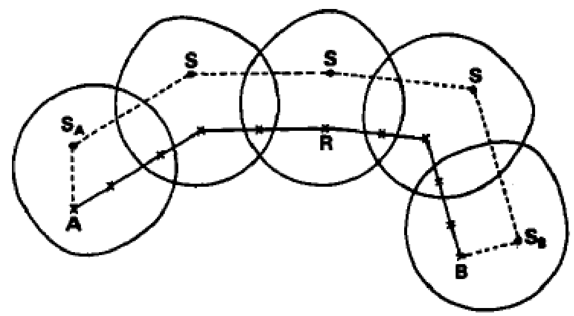
The '471 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '471 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

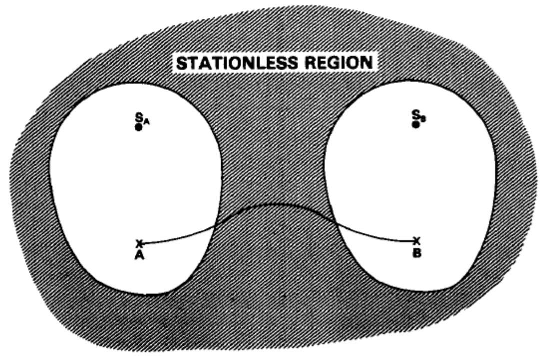
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '471 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '471 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
the first node process further comprises maintaining a second node link tree having second node link entries.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

The '471 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The

The '471 Patent – Claims	Kahn 1978
	detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for

The '471 Patent – Claims	Kahn 1978
authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

The '471 Patent – Claims	Kahn 1978
send/receive data buffer in digital memory, and	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route

The '471 Patent – Claims	Kahn 1978
	the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve

The '471 Patent – Claims	Kahn 1978
	table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and

The '471 Patent – Claims	Kahn 1978
	control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	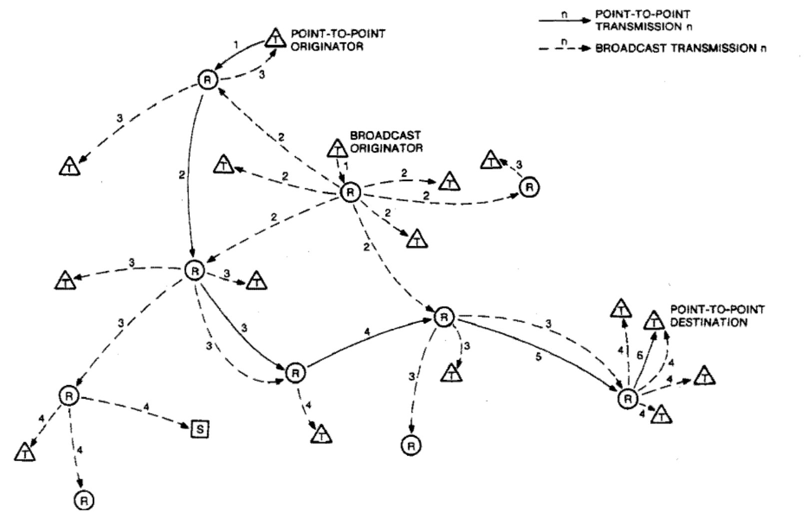 Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

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	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '471 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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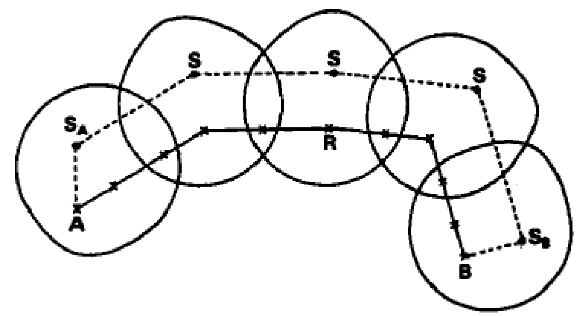
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '471 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

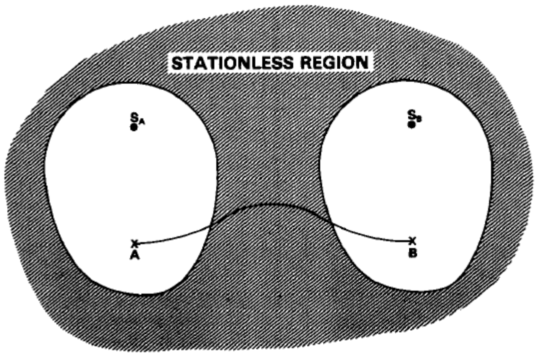
The '471 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
maintaining a second node link tree having second node link entries at the first node.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The

The '471 Patent – Claims	Kahn 1978
	detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic;	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

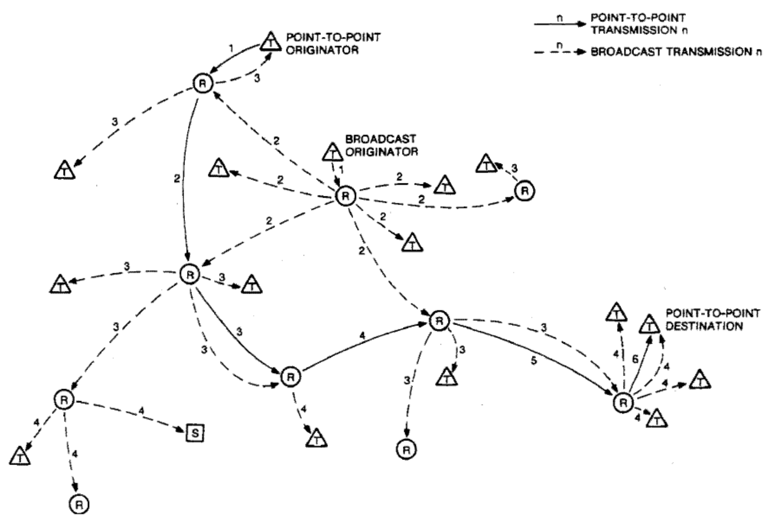
The '471 Patent – Claims	Kahn 1978
	people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from

The '471 Patent – Claims	Kahn 1978
	each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978
	This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and

The '471 Patent – Claims	Kahn 1978
	maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the

The '471 Patent – Claims	Kahn 1978
	packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.

The '471 Patent – Claims	Kahn 1978
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate

The '471 Patent – Claims	Kahn 1978
	routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact

The '471 Patent – Claims	Kahn 1978
	time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496. "D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms

The '471 Patent – Claims	Kahn 1978
	The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '471 Patent – Claims	Kahn 1978

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	Kahn 1978
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which

The '496 Patent – Claims	Kahn 1978
	consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '496 Patent – Claims	Kahn 1978
	"A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A

The '496 Patent – Claims	Kahn 1978
	route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For

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	example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit

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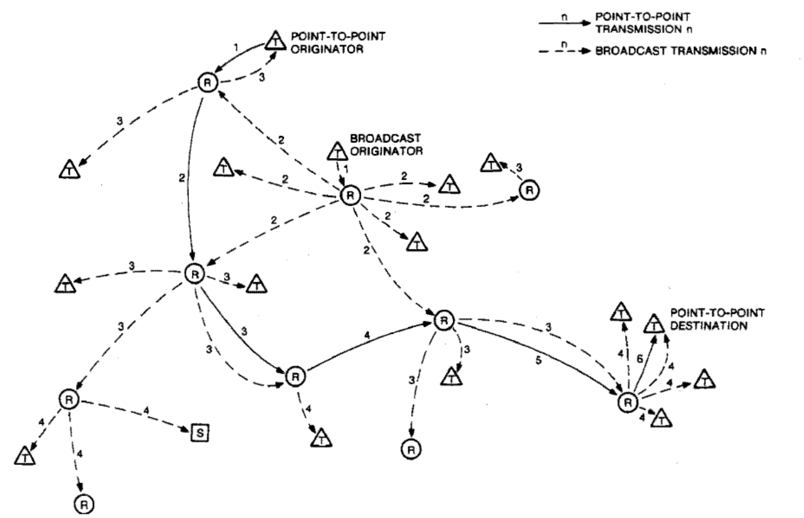
	reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients;	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station

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and	then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

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	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other

The '496 Patent – Claims	Kahn 1978
	stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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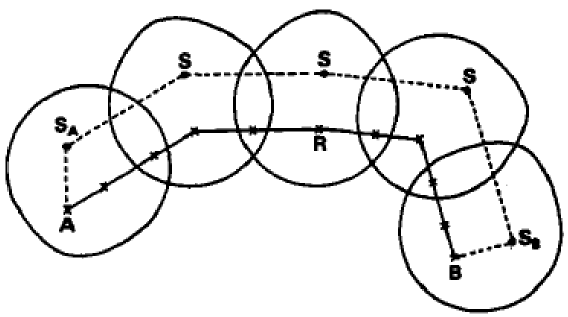
	discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

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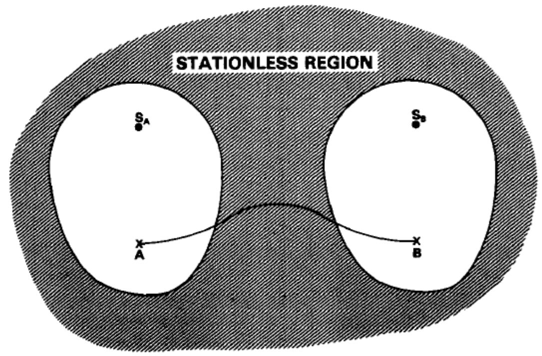
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In

The '496 Patent – Claims	Kahn 1978
	particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

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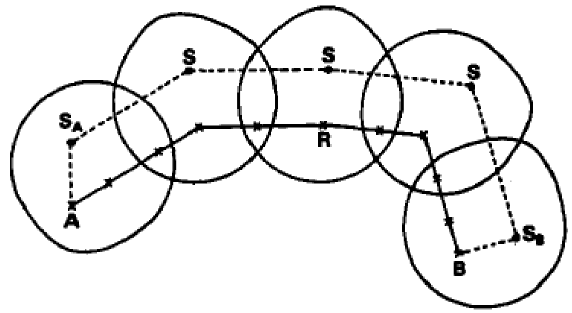
	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination

The '496 Patent – Claims	Kahn 1978
	station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483.

The '496 Patent – Claims	Kahn 1978
	Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484.

The '496 Patent – Claims	Kahn 1978
	"Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

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	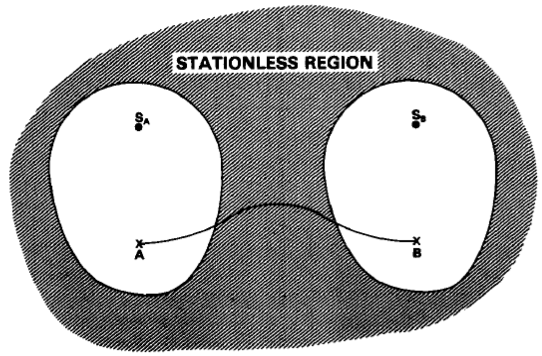 Fig. 11. Communication across a stationless region.
maintain a client link tree having client link entries representing each of the plurality of clients.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current

The '496 Patent – Claims	Kahn 1978
	overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which

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radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication

The '496 Patent – Claims	Kahn 1978
	failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the

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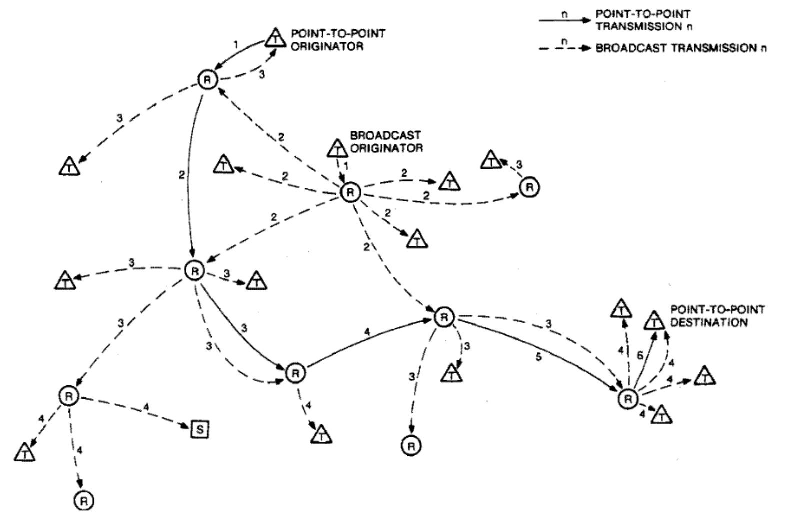
	network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the

The '496 Patent – Claims	Kahn 1978
	packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

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	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

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	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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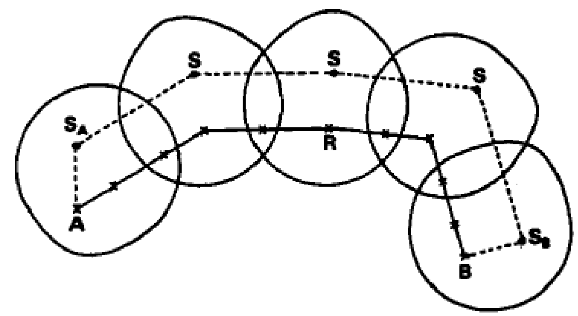
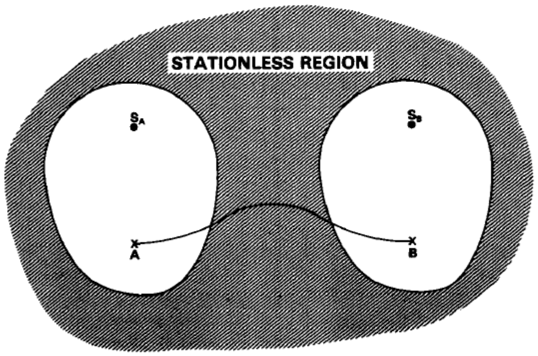
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

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each of the clients to the respective clients.	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The

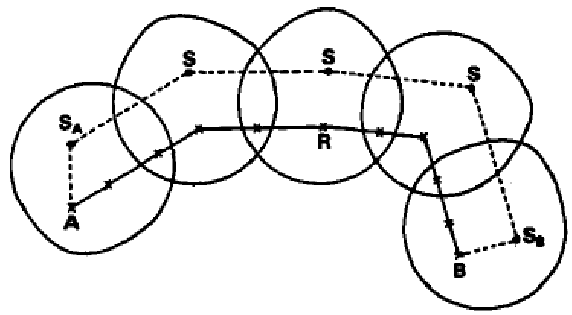
The '496 Patent – Claims	Kahn 1978
	detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for

The '496 Patent – Claims	Kahn 1978
said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device

The '496 Patent – Claims	Kahn 1978
	in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly

The '496 Patent – Claims	Kahn 1978
	attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the

The '496 Patent – Claims	Kahn 1978
	remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

The '496 Patent – Claims	Kahn 1978
	 **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated

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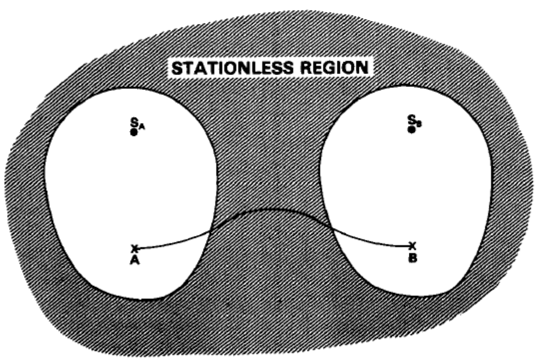
	round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

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7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	“A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions).” Kahn 1978 at 1469. “Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible.” Kahn 1978 at 1477. “Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module.” Kahn 1978 at 1488. “The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2].” Kahn 1978 at 1494.

The '496 Patent – Claims	Kahn 1978
	"An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be

The '496 Patent – Claims	Kahn 1978
	dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally

The '496 Patent – Claims	Kahn 1978
	inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source

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	of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477.

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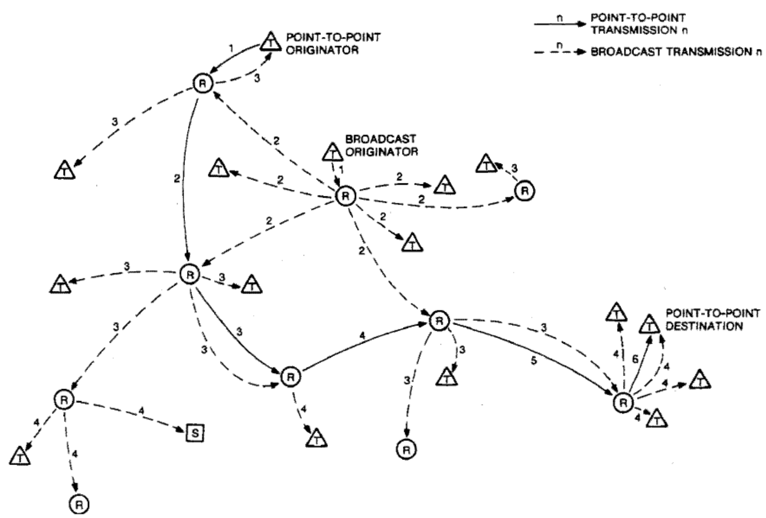
	"Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall

The '496 Patent – Claims	Kahn 1978
	connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information

The '496 Patent – Claims	Kahn 1978
	in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482.

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	"We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled

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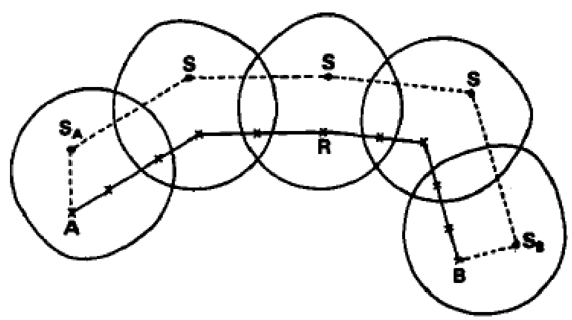
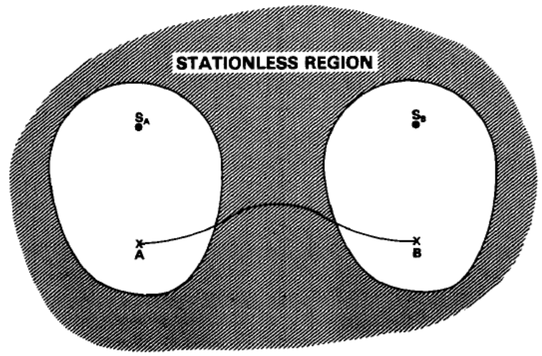
	by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to

The '496 Patent – Claims	Kahn 1978
	discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	Fig. 11. Communication across a stationless region.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

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	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device

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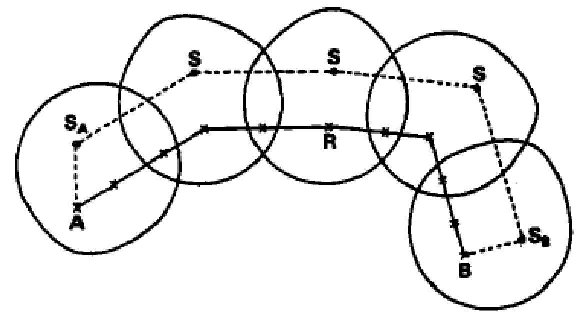
	in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly

The '496 Patent – Claims	Kahn 1978
	attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the

The '496 Patent – Claims	Kahn 1978
	remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated

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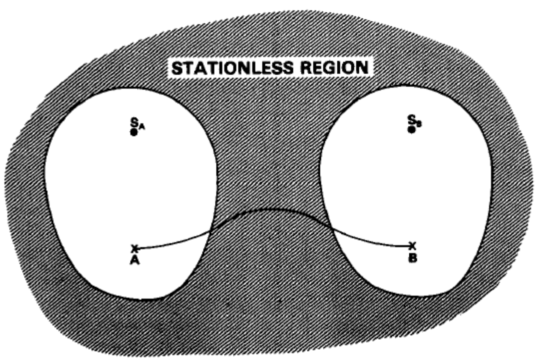
	round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

The '496 Patent – Claims	Kahn 1978
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

The '496 Patent – Claims	Kahn 1978
	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the

The '496 Patent – Claims	Kahn 1978
not already in said client link tree.	desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-

The '496 Patent – Claims	Kahn 1978
	point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	"Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483.

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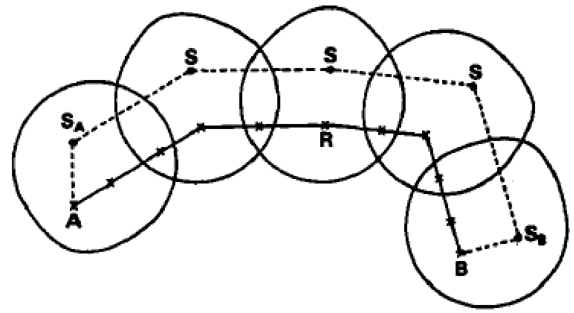
	"The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

The '496 Patent – Claims	Kahn 1978
	 **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will

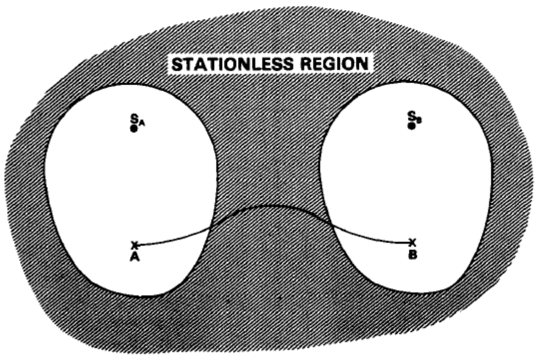
The '496 Patent – Claims	Kahn 1978
	wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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	"An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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	1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup

The '496 Patent – Claims	Kahn 1978
	packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

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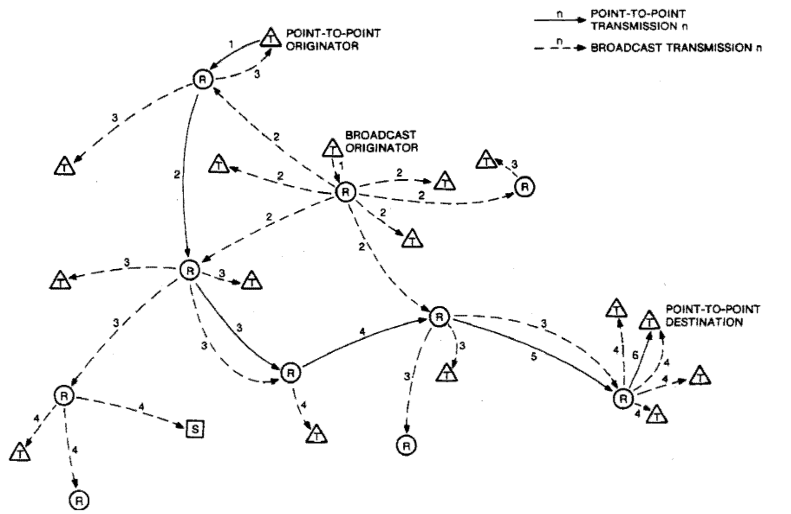
	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically)

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	and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range

The '496 Patent – Claims	Kahn 1978
	of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each

The '496 Patent – Claims	Kahn 1978
	station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station

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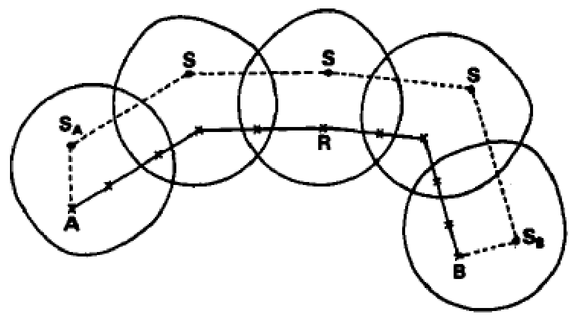
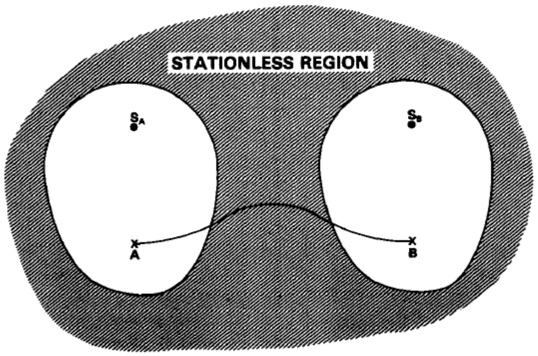
	which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

The '496 Patent – Claims	**Kahn 1978**
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

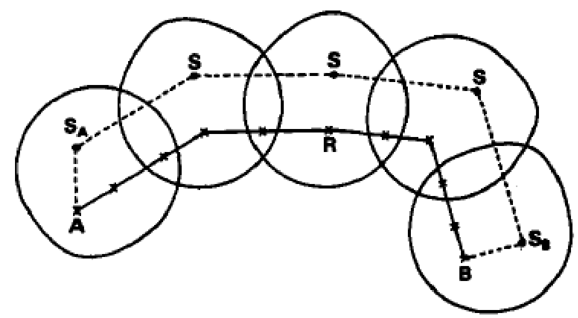
The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In

The '496 Patent – Claims	Kahn 1978
	particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

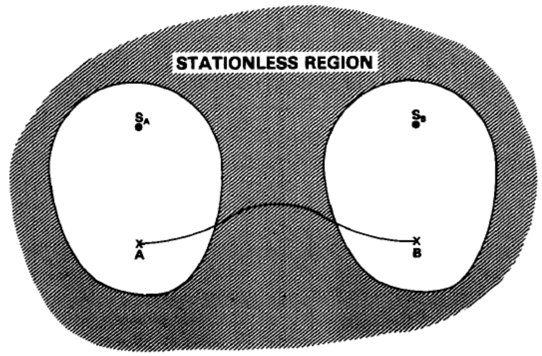
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination

The '496 Patent – Claims	Kahn 1978
	station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483.

The '496 Patent – Claims	Kahn 1978
	Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484.

The '496 Patent – Claims	Kahn 1978
	"Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
maintains a client link tree having client link entries representing each of the plurality of clients.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current

The '496 Patent – Claims	Kahn 1978
	overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which

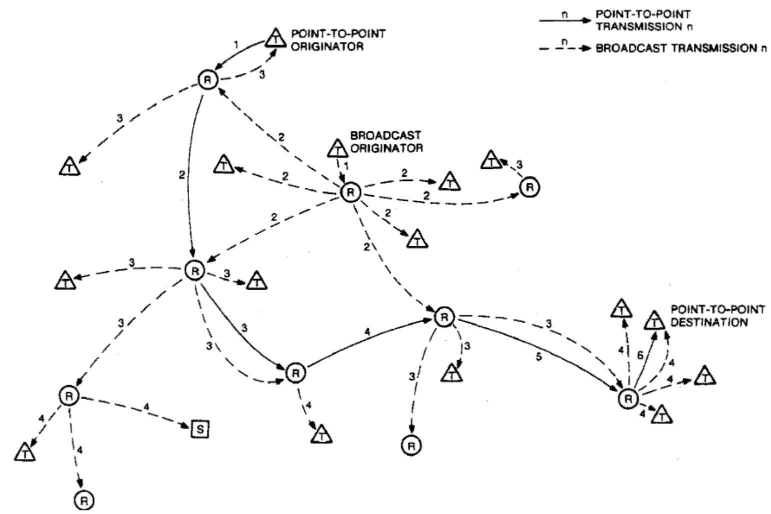
The '496 Patent – Claims	Kahn 1978
	collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication

The '496 Patent – Claims	Kahn 1978
	failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the

The '496 Patent – Claims	Kahn 1978
	network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the

The '496 Patent – Claims	Kahn 1978
	packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

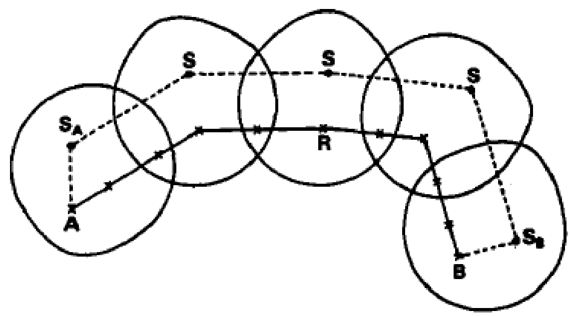
The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

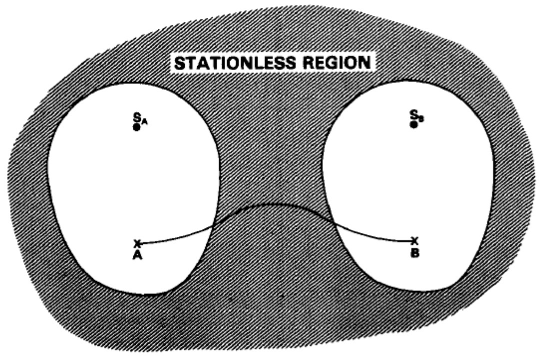
The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	**Kahn 1978**
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

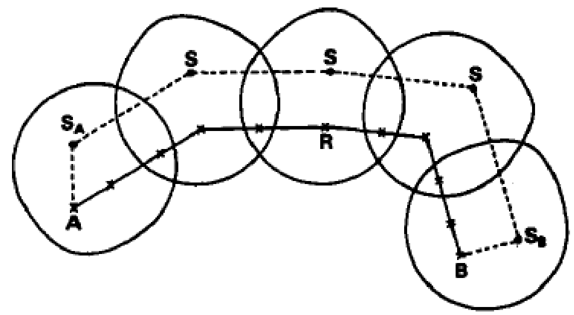
The '496 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device

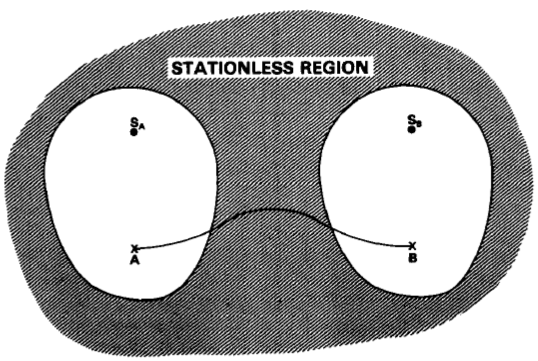
The '496 Patent – Claims	Kahn 1978
	in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly

The '496 Patent – Claims	Kahn 1978
	attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the

The '496 Patent – Claims	Kahn 1978
	remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated

The '496 Patent – Claims	Kahn 1978
	round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

The '496 Patent – Claims	Kahn 1978
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

The '496 Patent – Claims	Kahn 1978
	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.

The '496 Patent – Claims	Kahn 1978
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information?

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	One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and

The '496 Patent – Claims	Kahn 1978
	by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a

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	packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

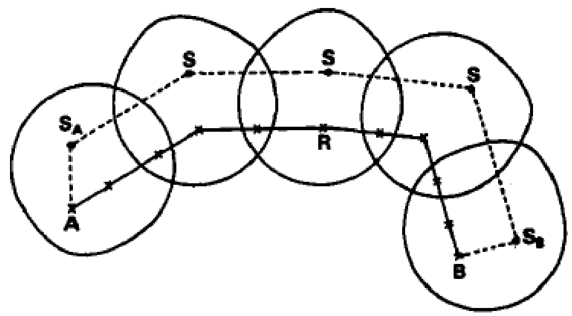
The '496 Patent – Claims	Kahn 1978
	 Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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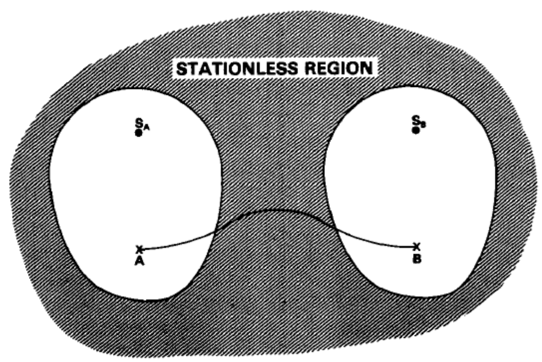
	wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

The '496 Patent – Claims	Kahn 1978
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494.

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	"An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn

The '496 Patent – Claims	Kahn 1978
	1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup

The '496 Patent – Claims	Kahn 1978
	packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

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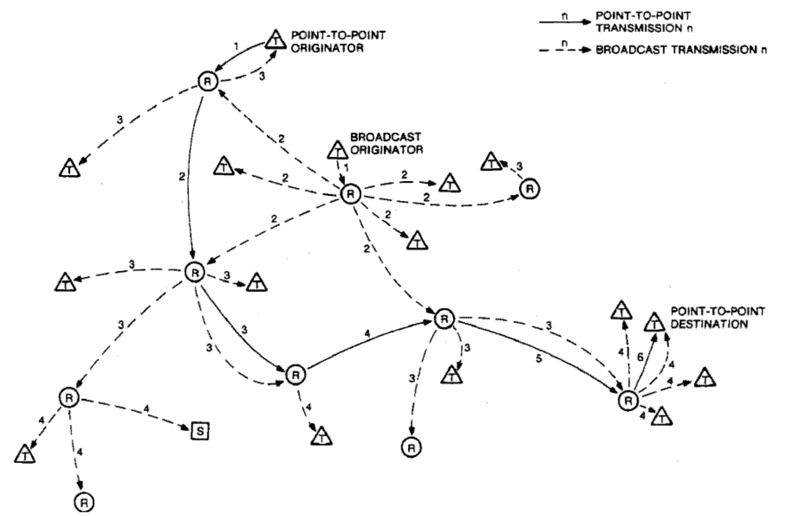
	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	"Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically)

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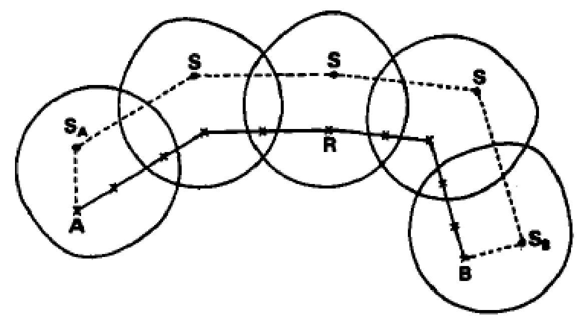
	and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range

The '496 Patent – Claims	Kahn 1978
	of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each

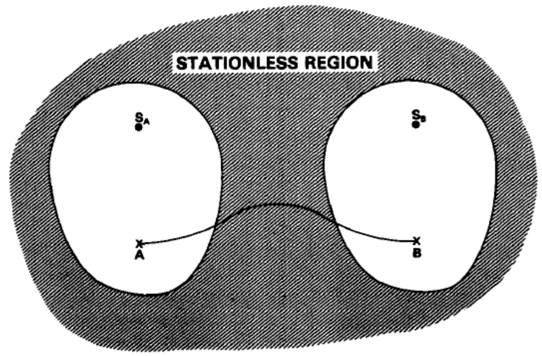
The '496 Patent – Claims	Kahn 1978
	station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

The '496 Patent – Claims	Kahn 1978
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

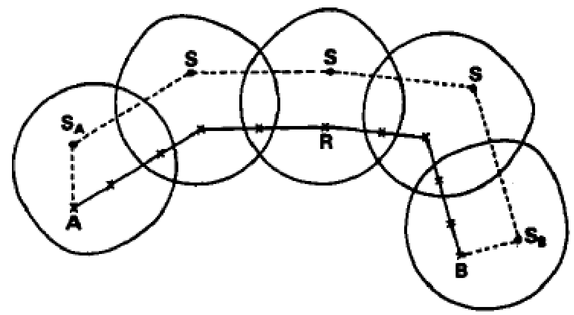
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In

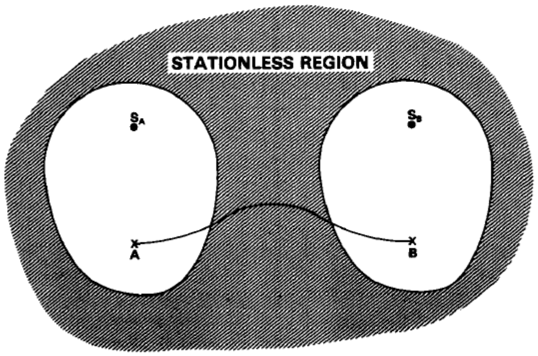
The '496 Patent – Claims	Kahn 1978
	particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482.

The '496 Patent – Claims	Kahn 1978
	"The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination

The '496 Patent – Claims	Kahn 1978
	station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483.

The '496 Patent – Claims	Kahn 1978
	Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484.

The '496 Patent – Claims	Kahn 1978
	"Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
maintains a client link tree having client link entries representing each of the plurality of clients.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current

The '496 Patent – Claims	Kahn 1978
	overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which

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	collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

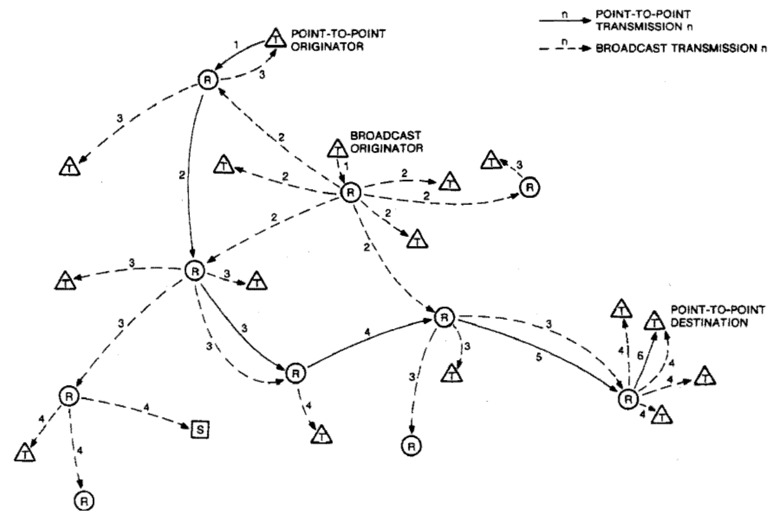
The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication

The '496 Patent – Claims	Kahn 1978
	failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the

The '496 Patent – Claims	Kahn 1978
	network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the

The '496 Patent – Claims	Kahn 1978
	packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

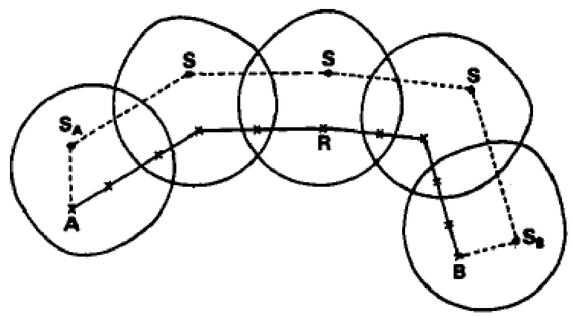
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

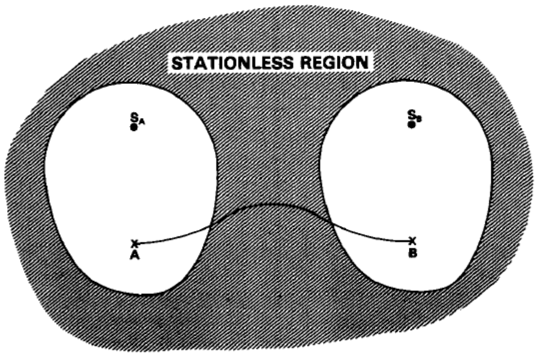
The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

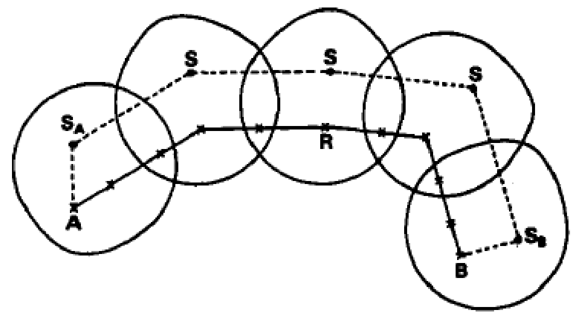
The '496 Patent – Claims	Kahn 1978
	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device

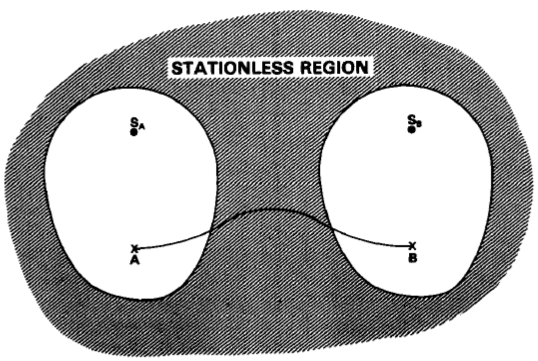
The '496 Patent – Claims	Kahn 1978
	in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly

The '496 Patent – Claims	Kahn 1978
	attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the

The '496 Patent – Claims	Kahn 1978
	remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated

The '496 Patent – Claims	Kahn 1978
	round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

The '496 Patent – Claims	Kahn 1978
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

The '496 Patent – Claims	Kahn 1978
	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the

The '496 Patent – Claims	Kahn 1978
is not already in said client link tree.	desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-

The '496 Patent – Claims	Kahn 1978
	point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482.

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	"Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483.

The '496 Patent – Claims	Kahn 1978
	"The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):

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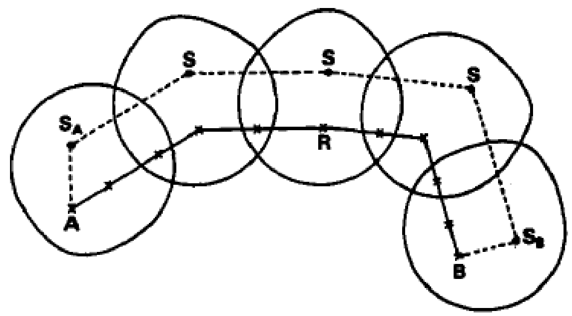
	Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

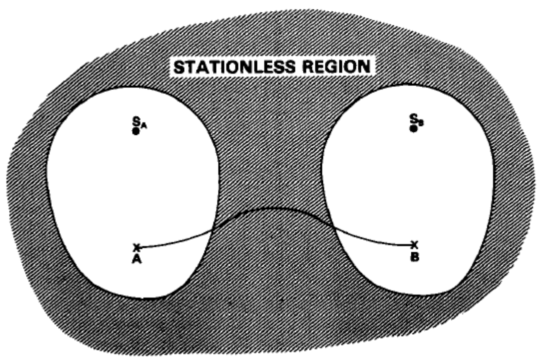
The '496 Patent – Claims	Kahn 1978
	wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494.

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	"An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn

The '496 Patent – Claims	Kahn 1978
	1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup

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	packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

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	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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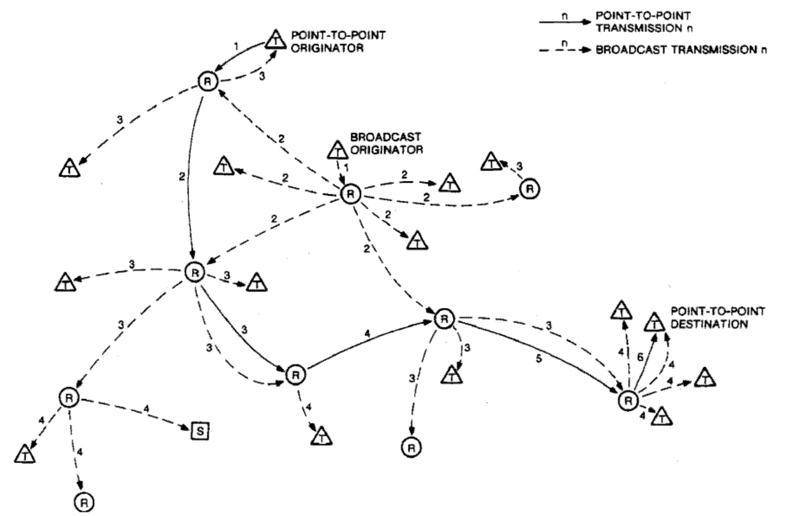
	"Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically)

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nodes,	and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range

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	of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each

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	station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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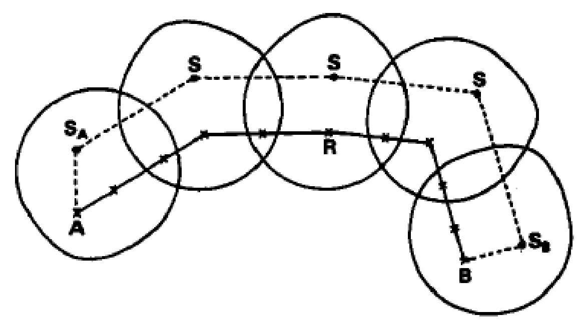
	which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

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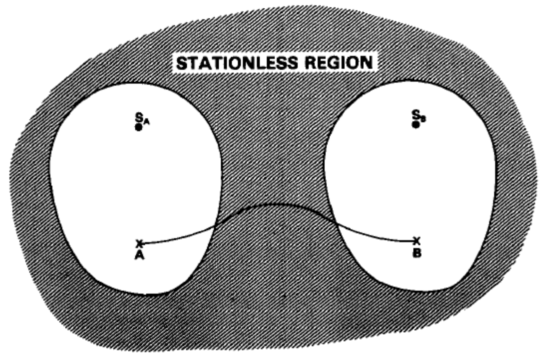
	"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the

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	network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain

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	neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

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conditions.	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
23. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

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recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a

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	stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way

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	that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are

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	rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by

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	the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is

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	input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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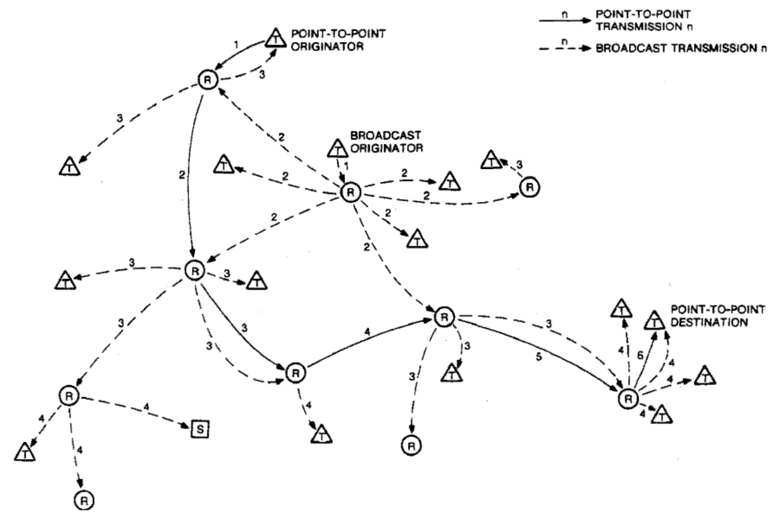
The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

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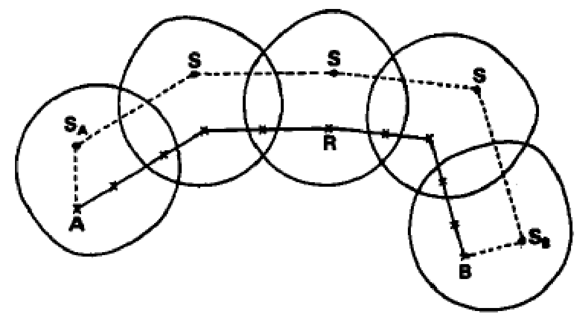
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

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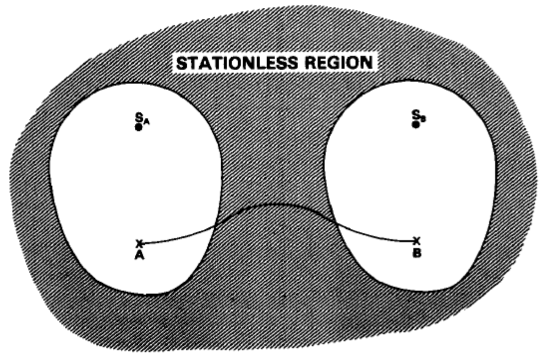
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

The '496 Patent – Claims	Kahn 1978
	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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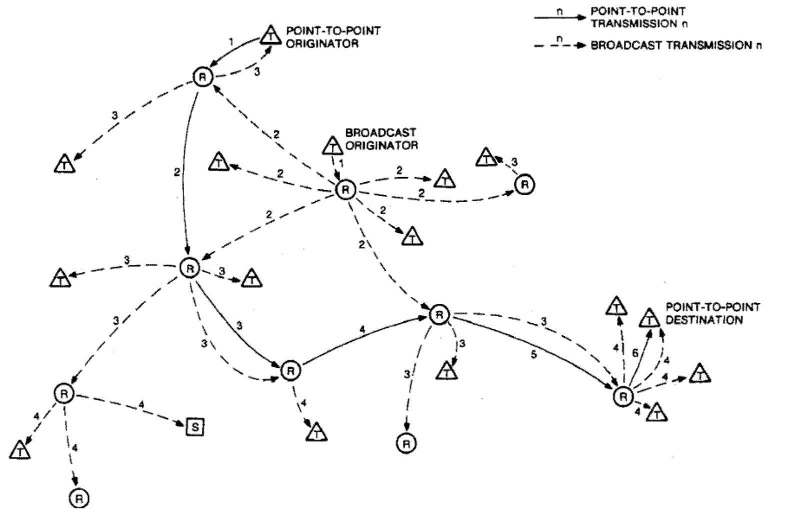
	and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may

The '496 Patent – Claims	Kahn 1978
	actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or

The '496 Patent – Claims	Kahn 1978
	processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481.

The '496 Patent – Claims	Kahn 1978
	"3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in

The '496 Patent – Claims	Kahn 1978
	its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.

The '496 Patent – Claims	Kahn 1978
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469.

The '496 Patent – Claims	Kahn 1978
receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	"Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it

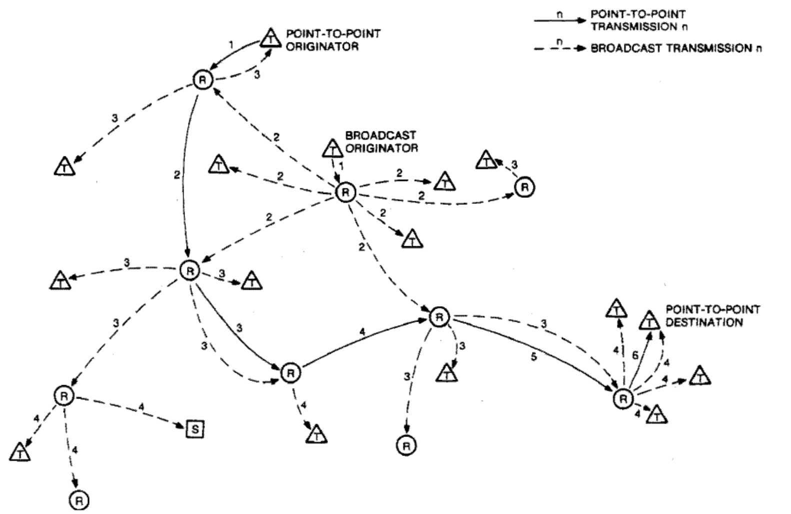
The '496 Patent – Claims	Kahn 1978
	performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along

The '496 Patent – Claims	Kahn 1978
	the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the

The '496 Patent – Claims	Kahn 1978
	station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an

The '496 Patent – Claims	Kahn 1978
	operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or

The '496 Patent – Claims	Kahn 1978
	processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in some link." Kahn 1978 at 1481.

The '496 Patent – Claims	Kahn 1978
	"3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route

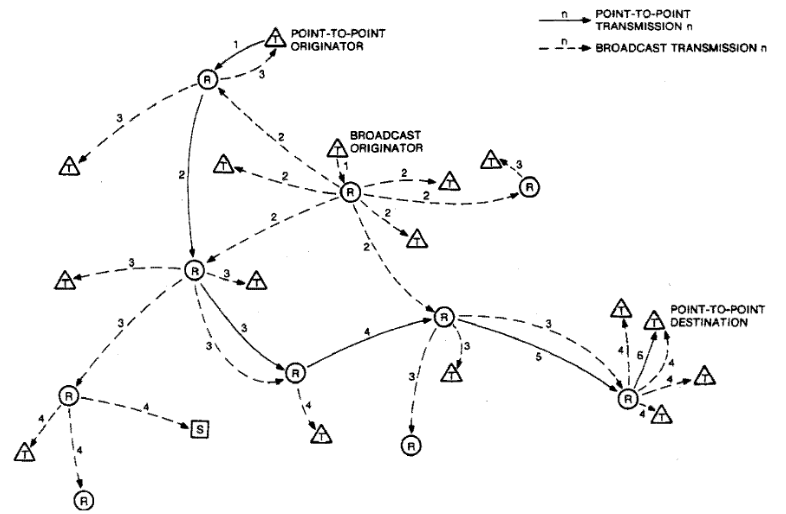
The '496 Patent – Claims	**Kahn 1978**
	the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve

The '496 Patent – Claims	Kahn 1978
	table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '496 Patent – Claims	Kahn 1978
	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and

The '496 Patent – Claims	Kahn 1978
	control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

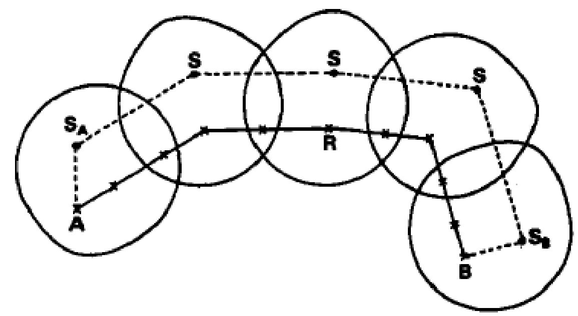
Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

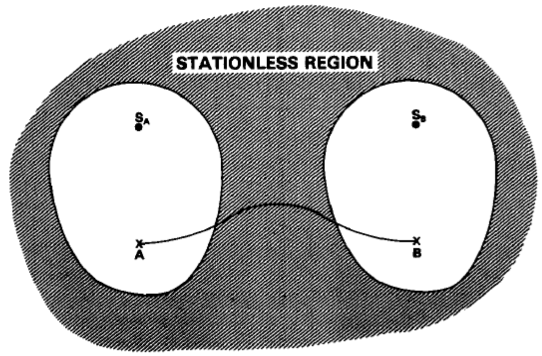
The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which

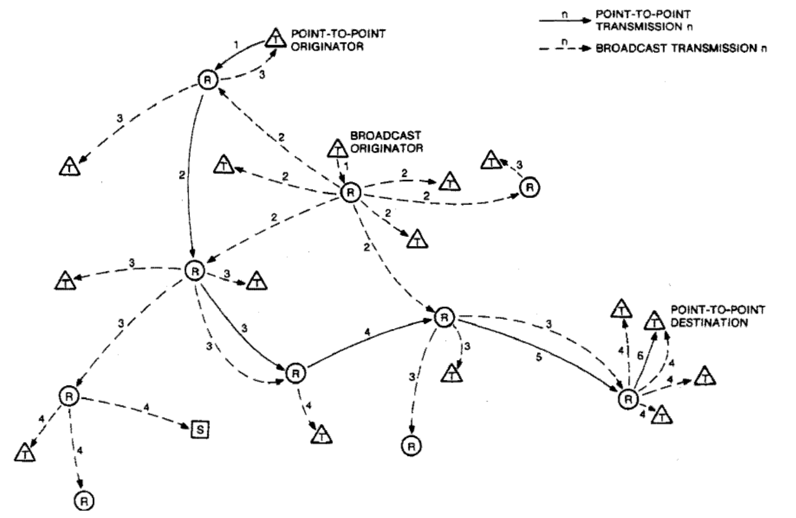
The '496 Patent – Claims	Kahn 1978
	collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication

The '496 Patent – Claims	Kahn 1978
	failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the

The '496 Patent – Claims	Kahn 1978
	network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the

The '496 Patent – Claims	Kahn 1978
	packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

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	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

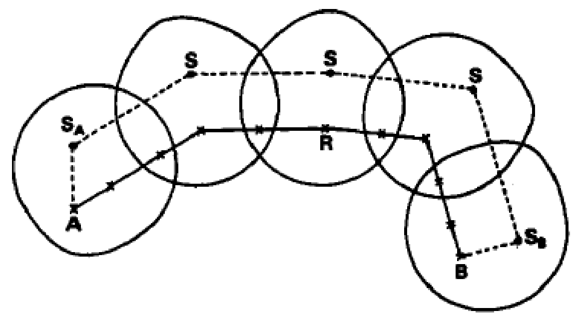
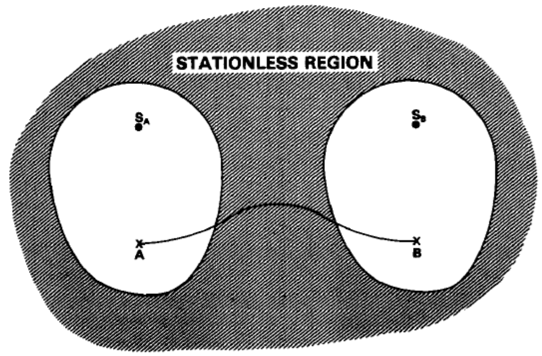
The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

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	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

The '496 Patent – Claims	Kahn 1978
	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net

The '496 Patent – Claims	Kahn 1978
	and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may

The '496 Patent – Claims	Kahn 1978
	actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	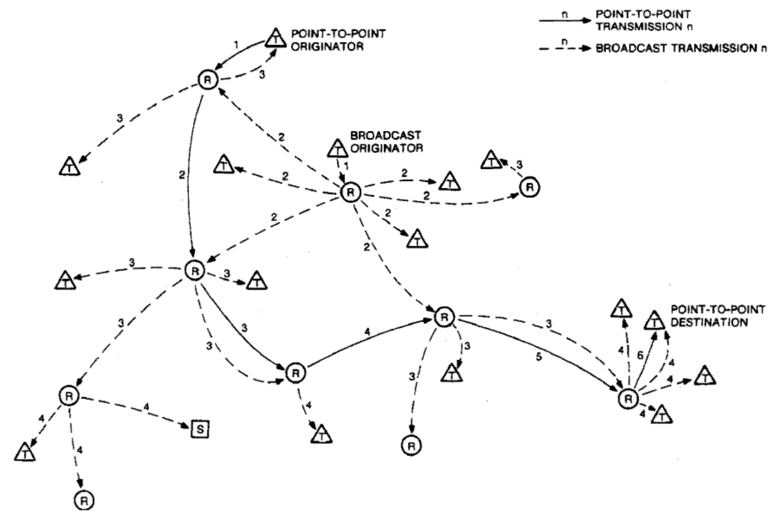 Fig. 9. Point-to-point and broadcast routing.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination.

The '496 Patent – Claims	Kahn 1978
	Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
35. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

The '496 Patent – Claims	Kahn 1978
recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	(transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

The '496 Patent – Claims	Kahn 1978
	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '496 Patent – Claims	Kahn 1978
	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a

The '496 Patent – Claims	Kahn 1978
	nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	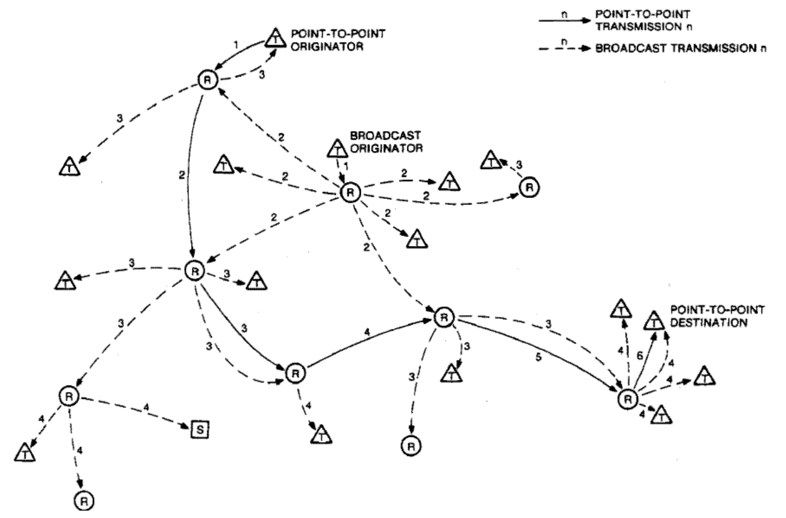 Fig. 9. Point-to-point and broadcast routing.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

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The '496 Patent – Claims	Kahn 1978
	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network

The '496 Patent – Claims	Kahn 1978
	routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed

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	to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream

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	repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net

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	[24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the

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	packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	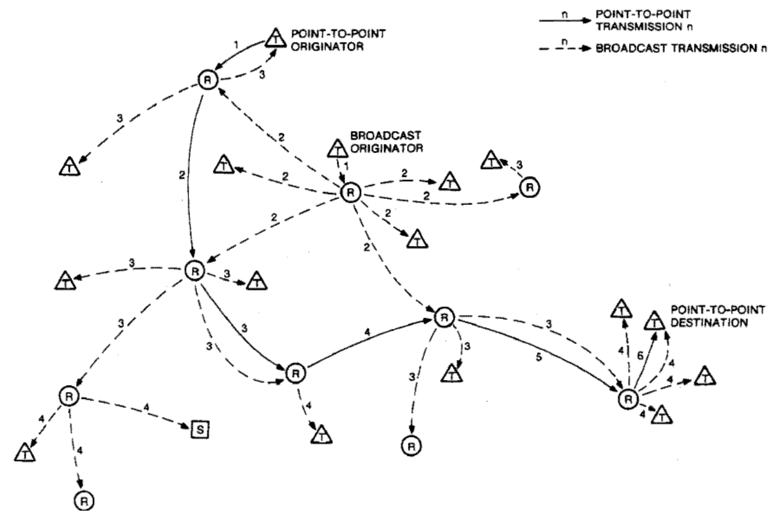 Fig. 9. Point-to-point and broadcast routing.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

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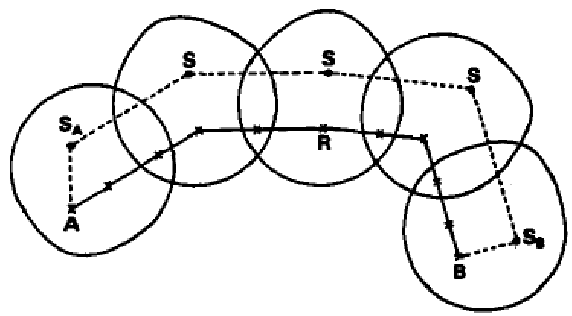
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

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	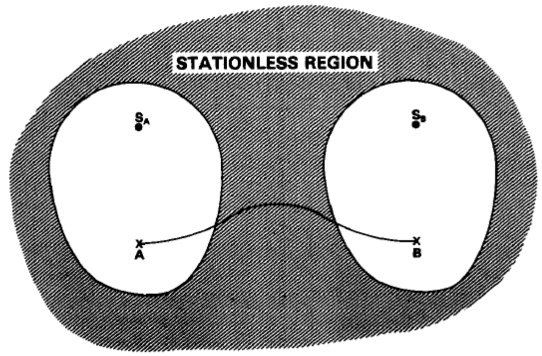 Fig. 11. Communication across a stationless region.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which

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	collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

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	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication

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	failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the

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	network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the

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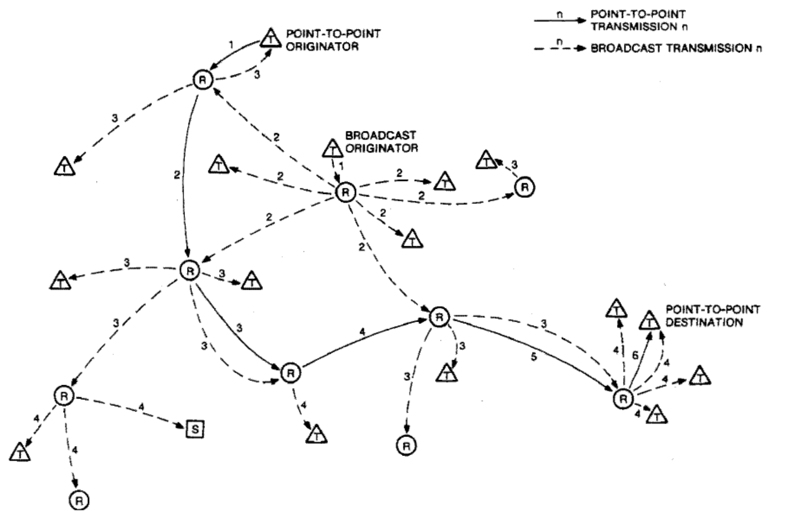
	packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

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	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

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	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

<table>
<tr><th>The '496 Patent – Claims</th><th>Kahn 1978</th></tr>
<tr><td></td><td>route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483.

Kahn 1978 at 1484 (Fig. 10):

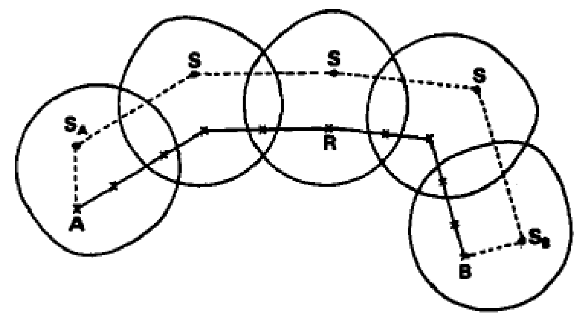
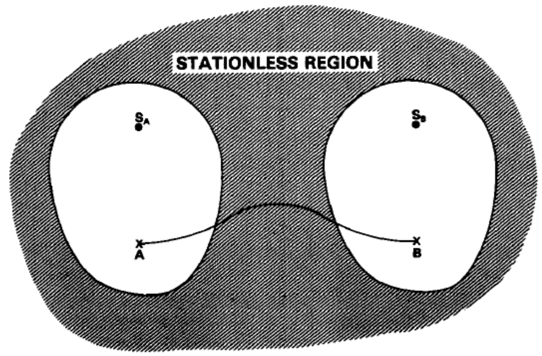


Fig. 10. Route finding and route setup with multiple station operation.

"For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484.

"A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely</td></tr>
</table>

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479.

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	"From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The

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	detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic;	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "With the addition of a communication security function, the packet radio net would then provide an integrated communication, navigation, and identification system for

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	secure tactical use." Kahn 1978 at 1470-71. "For any given transmitted packet, a sequence of codes is constructed from this finite code set according to a nonlinear secure algorithm. The sequence constructed depends on the slot number during which transmission begins and certain other parameters used by the algorithm. Use of this technique allows a good algorithm operating at low power and low speed to specify a high speed chip stream having the desired unpredictability to an observer outside of the system." Khan 1978 at 1492.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

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	in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume

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	topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

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	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to

The '496 Patent – Claims	Kahn 1978
	each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream

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	repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

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	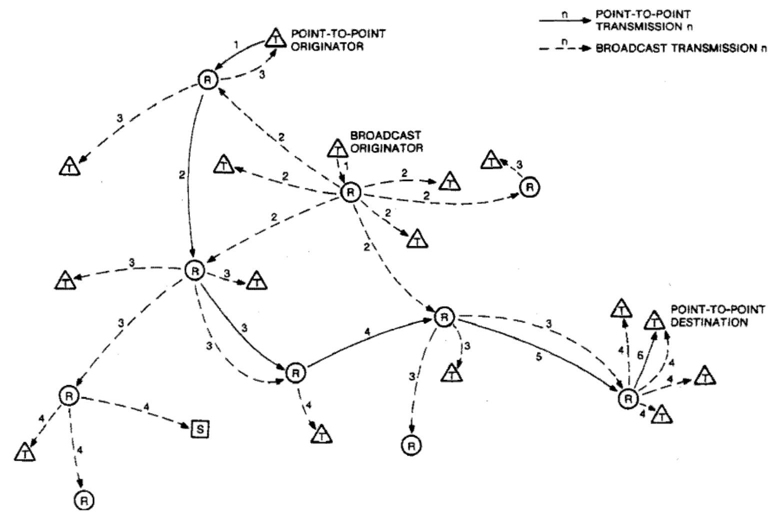 Fig. 9. Point-to-point and broadcast routing.
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes;	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

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send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination

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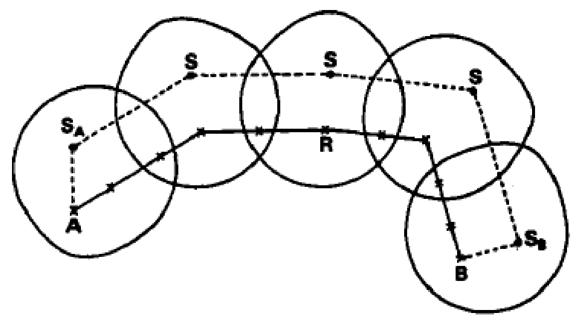
	station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of

The '496 Patent – Claims	Kahn 1978
	selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence

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	number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

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	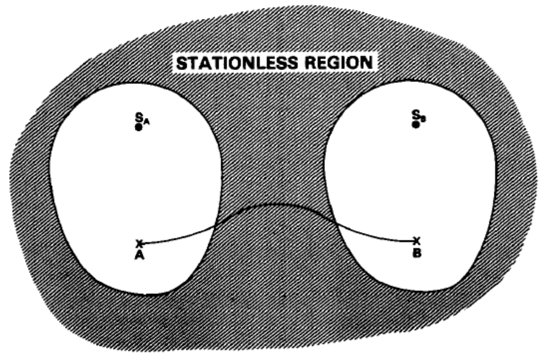 Fig. 11. Communication across a stationless region.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477. "The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current

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	overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "[34] V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," this issue, pp. 1386-1408." Kahn 1978 at 1496.

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	"D. lntemetting The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "H. Reliable Delivery Mechanisms The inherent undependability of a mobile radio channel requires an end-to-end protocol to provide reliable operation. For internal network control traffic (nonuser traffic), where perhaps one outstanding unacknowledged packet is sufficient, a highly efficient but specially designed protocol suffices. For intranet user traffic, or internet operation, a more flexible and higher performance protocol is desirable. We assume an end-to-end error detection and retransmission technique to be used in the network for reliable delivery of individual packets. Each source/destination pair on the network could utilize an end-to-end protocol such as described in [38], which also supports internetworking. In this case the user's terminal could be equipped with a microprocessor-based device known as a Terminal Interface Unit (TIU) which performs the end-to-end protocol, and any local support for the terminal (e.g., local echoing, formatting). The TIU interfaces directly to the digital unit of a packet radio. Within the PRNET, stations and radios need to communicate control packets reliably. For example, the regular reports from each radio to the station are used to validate the radio's continued availability. Without an effective recovery procedure the station could declare a perfectly good radio to be out of order and remove it from service if several of its reports were lost consecutively. Similarly, parameter change packets from the station to the radio should be delivered reliably since these are used to set dynamically important radio parameters, such as the retransmission interval or

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	the maximum number of allowed retransmissions. The Station-PR Protocol (SPP) provides the reliable delivery mechanism." "By using internet protocols to access the station's X-RAY process, even the radios can be remotely debugged from the ARPANET." Kahn 1978 at 1494. "[38] V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648, May 1974." Kahn 1978 at 1496.
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to

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	people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from

The '496 Patent – Claims	Kahn 1978
	each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet.

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	This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and

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	maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the

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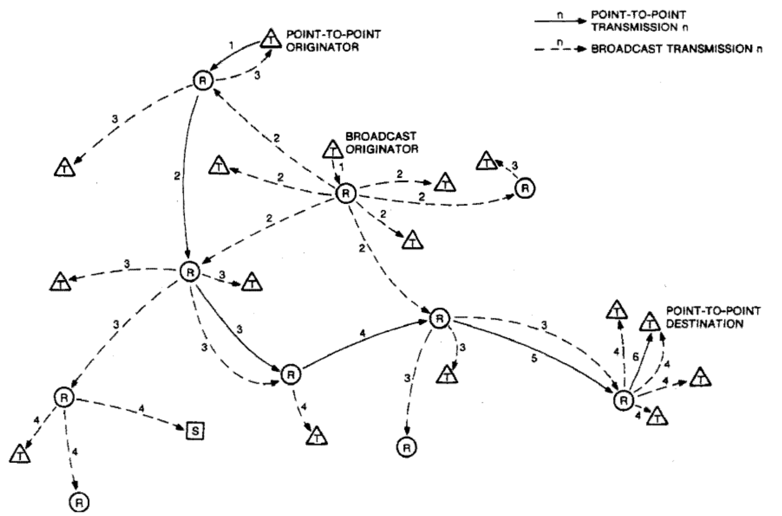
	packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):  Fig. 9. Point-to-point and broadcast routing.

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wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an

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	ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it

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	can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each

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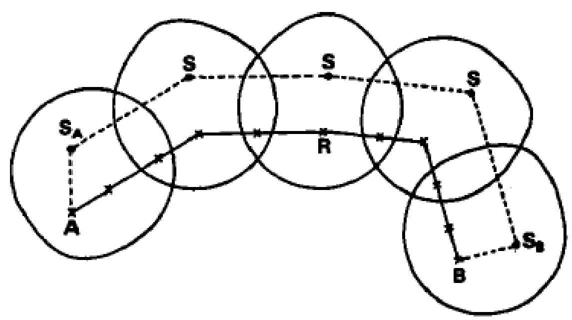
	neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation.

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	"For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the

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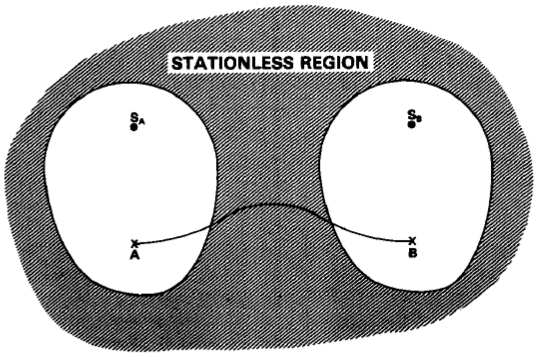
	selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):  Fig. 11. Communication across a stationless region.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The

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	normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477.

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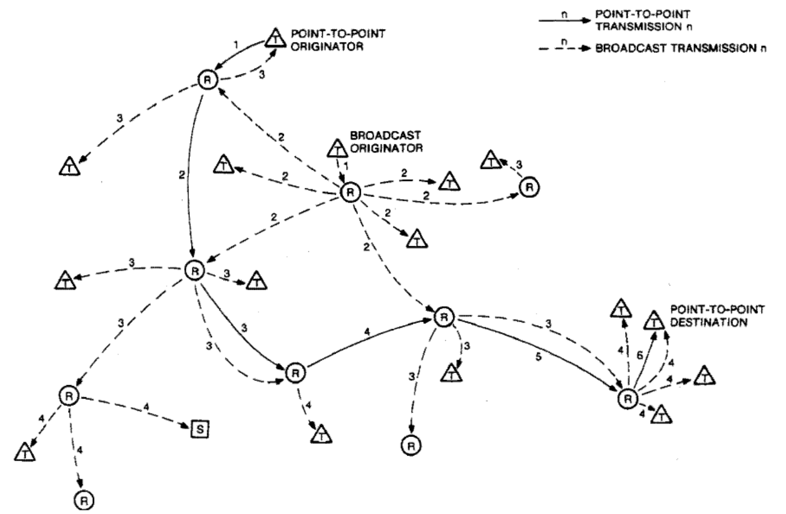
	"The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a

The '496 Patent – Claims	Kahn 1978
	packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be

The '496 Patent – Claims	Kahn 1978
	dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the

The '496 Patent – Claims	Kahn 1978
	packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset." Kahn 1978 at 1477.

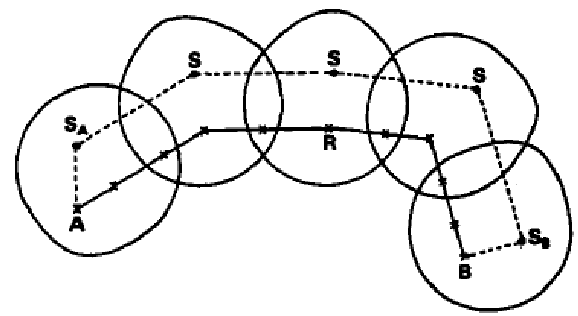
The '496 Patent – Claims	Kahn 1978
	"The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity." Kahn 1978 at 1479. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios

The '496 Patent – Claims	Kahn 1978
	have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range

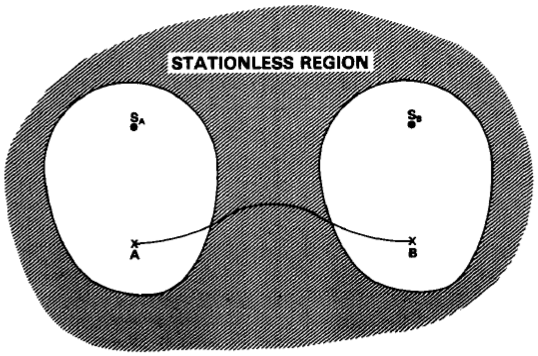
The '496 Patent – Claims	Kahn 1978
	of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening

The '496 Patent – Claims	Kahn 1978
	stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

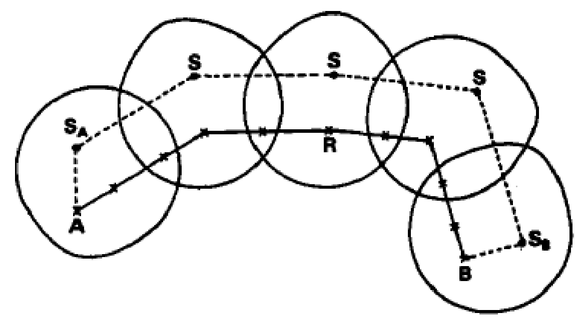
The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "[E]ach station is aware of all operational radios in the network. The stations discover

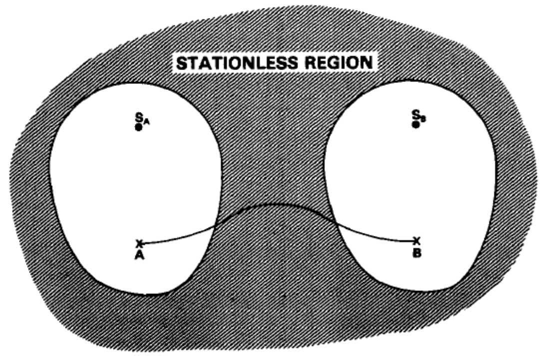
The '496 Patent – Claims	Kahn 1978
	the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network." Kahn 1978 at 1477. "In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information

The '496 Patent – Claims	Kahn 1978
	in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile, a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to

The '496 Patent – Claims	Kahn 1978
	obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "From the summary ROP's, each station knows the identity of its neighboring stations and a point-to-point route to each radio labeled by itself and a neighbor." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup

The '496 Patent – Claims	Kahn 1978
	procedure described earlier in this section. This process is illustrated in Fig. 10. The route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  **Fig. 10. Route finding and route setup with multiple station operation.** "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet

The '496 Patent – Claims	Kahn 1978
	appends its own selector to the data field, stores the information which uniquely identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477.

The '496 Patent – Claims	Kahn 1978
	"Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate

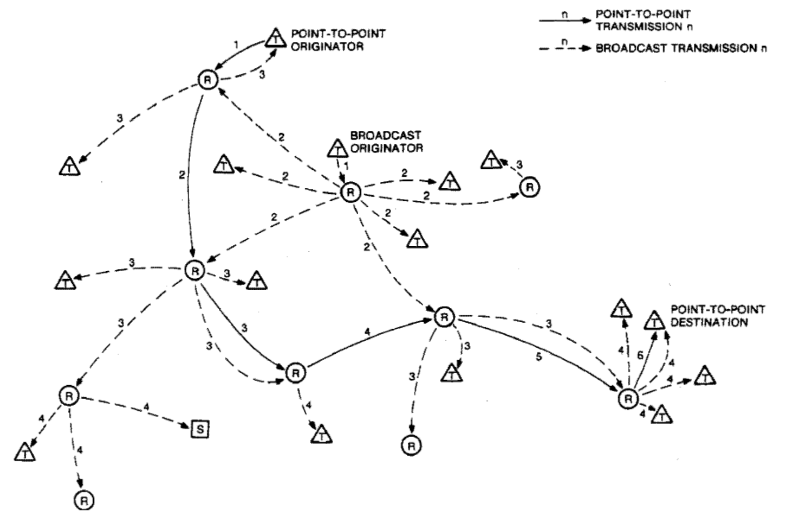
The '496 Patent – Claims	Kahn 1978
	(transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470. "The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each

The '496 Patent – Claims	Kahn 1978
	source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482. "A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480.

The '496 Patent – Claims	Kahn 1978
	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477.

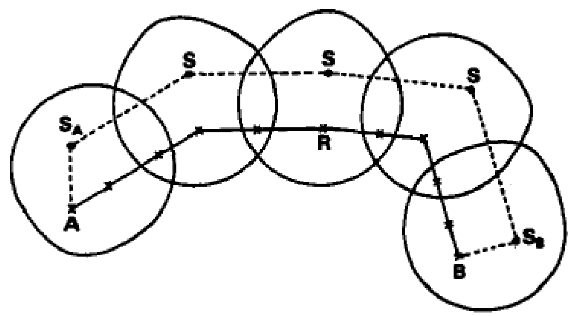
The '496 Patent – Claims	Kahn 1978
	"In the point-to-point routing procedure, a packet originating at one part of the network proceeds directly through a series of one or more repeaters until it reaches its final destination. The point-to-point route (which consists of an ordered set of selectors) is first determined by a station which is the only element in the net that knows the current overall system connectivity. Having determined a good point-to-point route, where should the station send the point-to-point routing information? One possibility is for it to distribute the information to the individual repeaters along the point-to-point route. In this case, each succeeding packet would only require some form of source and/or destination identifier but would not have to carry the entire route in its header. Alternatively, the station can send it directly to the digital section of the sender's (or receiver's) packet radio. In this case, each packet originating at that radio could then contain the entire set of selectors in its header." Kahn 1978 at 1479. "When a station is first connected to an operational packet radio, it will soon hear an ROP from that radio over the host interface after which the station will promptly 'label' the radio. The labeling process consists of first determining and then supplying the radio with a route (i.e., a set of selectors) to the station. In this first step, the task is trivial since the route to the station is via the host interface. In principle, once labeled, the packet radio periodically will continue to send its ROP's over the host interface to the station along with the less frequent summary ROP's. From the status information in these ROP's, the station will learn which radios are in direct communication range of its radio." Kahn 1978 at 1482. "The radio directly connected to the station is said to be at level 0 with respect to its station. All radios in direct communication range of the level 0 radio and not directly attached to the station are said to be at level l with respect to the station. Similarly, a radio in communication range of a level n-1 radio which is not itself already at level n-

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	1 or less is said to be at level n. A radio may be at different levels with respect to different stations, and its levels may change during mobile operation. A level simply indicates the minimum number of radio hops to the station and does not otherwise affect packet routing." Kahn 1978 at 1482. "Each radio has table space (labeling slots) for storing routes to several stations and by design the number of slots in each radio limits the number of stations that are allowed to label it. The route from a radio to a station is supplied by that station via the labeling process. Two stations which have labeled a common repeater are known as neighbors." Kahn 1978 at 1482. "One having labeled a radio, the station must relabel the radio within a given time or the labeling slot entry will expire. These entries are timed out (relatively slowly) by the radio, and the age of each entry is reported in its status reports. A station will always fail to successfully label a repeater which has no available labeling slots, but it can refresh an existing entry of its own at any time. A slot whose entry has expired is not erased by the radio (the route is not normally used either) but it may be overwritten by another station if no other labeling slots in the radio are free. In principle, a radio could be provided with diverse routes to a given station for applications such as mobile hand-off." Kahn 1978 at 1482. "We net [sic, next] describe routing through the multistation environment. Each station is assumed to know which radios it has labeled, but must inquire of other stations to learn the whereabouts of other radios (and their users). This inquiry is assumed to take place upon request by a user via a broadcast to all stations via neighboring stations. The inquiry process also provides the destination station with a set of selectors for a point-to-point route to the destination station from the originating user (if fixed) or station (for mobile users). If both users are highly mobile,

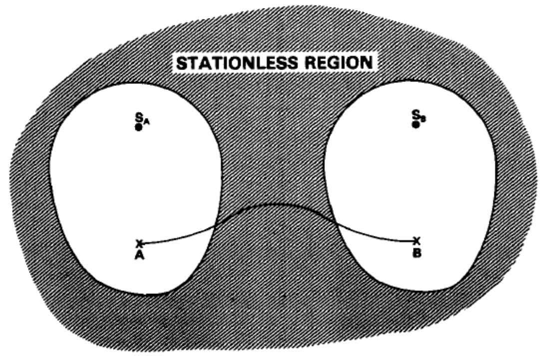
The '496 Patent – Claims	Kahn 1978
	a point-to-point route will be established between the two end stations which will individually handle the final distribution. If both users are fixed, the destination station will choose the last few selectors from among the radios it has labeled to obtain a point-to-point route directly between the two end users (with no intervening stations) and will supply it to the destination user. The actual point-to-point route setup is initiated by the destination user in this case, rather than by the destination station as was the case for mobile users. If one user is fixed and one user is highly mobile, the resulting point-to-point route will be between the fixed user and the remote station which will handle local distribution for the mobile user." Kahn 1978 at 1483. "The route selection process takes place as follows. A user's packet radio generates a packet for a destination outside the control of his station and his radio routes it to an appropriate local station (e.g., the closest one according to some metric). The station converts this packet into several distinct route finding packets which it sends to each neighboring station via some repeater jointly labeled by both stations. The conversion involves adding to the packet the station ID and a list of selectors from the user to the· jointly labeled repeater. When the packet is received by the neighboring station, it checks to see if the specified destination user is under its control. If not, it again converts the packet into several distinct packets by adding its own ID and a list of selectors from the original jointly labeled repeater to another repeater jointly labeled by a station not previously visited by the packet. If the packet arrives at a station which has just previously handled the same request via another route, it will be discarded by that station. In this way, one or more route finding packets will eventually arrive at a station which has labeled the destination user and will contain a composite list of selectors. The destination station then passes a complete list of selectors to the destination user's packet radio which initiates the route setup procedure described earlier in this section. This process is illustrated in Fig. 10. The

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	route finding path is shown as a series of dotted lines and the point-to-point route is shown as a series of solid lines." Kahn 1978 at 1483. Kahn 1978 at 1484 (Fig. 10):  Fig. 10. Route finding and route setup with multiple station operation. "For stationless operation, it is highly desirable for the radios to determine acceptable point-to-point routes, even if they only remain acceptable for short periods of time. In a technique that is very similar to multistation route finding, broadcasting can be used to find point-to-point routes which may be usable if the radio links are relatively stable. The repeater and terminals in the network cooperate with each other to discover and set up routes in three phases." Kahn 1978 at 1484. "A route finding packet is broadcast from the source PR when its attached device attempts to communicate with a destination for which a route is not yet known. This packet contains the source selector, the desired destination selector, and a sequence number which insures uniqueness. Any PR which hears the route finding packet appends its own selector to the data field, stores the information which uniquely

The '496 Patent – Claims	Kahn 1978
	identifies the packet, increments a 'hop' count in the packet and rebroadcasts it." Kahn 1978 at 1484. "Once the route finding packet arrives at the destination PR, it contains the estimated round-trip delay for a route which works in both directions. The destination PR will wait long enough to receive most of these packets (which may have travelled over different routes), will select the route with minimum delay, and will store this as the best route." Kahn 1978 at 1484. "Since the path discovered above may involve a very large number of selectors, it is clear that not all routing information can be stored in the data packets themselves. Some of the routing information must be stored in the intermediate PR's along the route. This is accomplished by a route setup procedure which is nominally identical to that which is used in the operational station case. A route setup packet is sent from the digital unit of the destination. PR which traverses the route specified in the selected route. This packet causes renewal table entries to be written in the intermediate PR's (in a table indexed by source and destination). Once this route setup packet arrives back at the source PR, the entire route is set up in both directions and we proceed to the final phase." Kahn 1978 at 1484. Kahn at 1485 (Fig. 11):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 11. Communication across a stationless region.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"A primary objective of a packet radio network is to support real-time interactive communications between computer resources (hosts) connected to the network and user terminals (e.g., terminal-host, host-host, and terminal-terminal interactions)." Kahn 1978 at 1469. "Aspects of the network protocols (such as the radio acknowledgment procedures) which must be performed by each radio would be distributed among all radio elements. However, all network control protocols which can have global effect are specifically initiated by one or more entities in the network called stations. The resulting network control thus takes the form of a two level hierarchical system. The normal mode of operation utilizes a single station or multiple station. However, a stationless mode is also possible." Kahn 1978 at 1477. "Functions provided within the station software installed in 1977 included: network routing control; a gateway to other networks; a network measurement facility which collects, stores, and delivers experimental statistics from any network components; a

The '496 Patent – Claims	Kahn 1978
	debugging facility which supports examining and depositing the contents of memory in the PR units; an information service which assists in locating and connecting to people currently using the PRNET; and an experiment configuration control module." Kahn 1978 at 1488. "The PRNET is normally connected to the ARPANET. This connection is accomplished using a gateway [34] process, co-located with the network station processor, to communicate with an ARPANET IMP [2]." Kahn 1978 at 1494. "An individual packet radio unit is a small piece of electronic equipment which consists of a radio section and a digital section which controls the radio. The radio section contains the antenna, RF transmitter/receiver, and all signal processing and data detection logic associated with modulation and demodulation. The digital section contains a microprocessor controller plus semiconductor memory for packet buffering and software. The radio and digital sections are connected by a high speed interface (see Fig. 6). For each transmitted packet, the digital unit selects the transmit frequency (normally fixed), data rate, power, and time of transmission. In addition, it performs the packet processing to route the packet through the network. In a half duplex mode of operation, a radio may be transmitting or receiving, but not both simultaneously. In the remainder of this paper we assume that each radio operates as a half duplex transceiver in the common frequency band." Kahn 1978 at 1477. "The packet radio network structure should be capable of internetting in such a way that a user providing a packet address in another net can expect his network to route the associated packet to a point of connection with the other net or to an intermediate (transit) net for forwarding. Similarly, arriving internet packets should also be routed to the local user." Kahn 1978 at 1470.

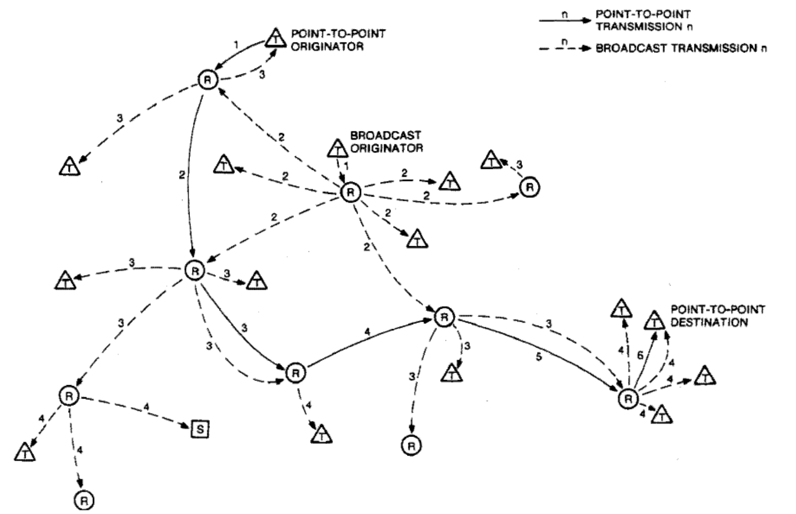
The '496 Patent – Claims	Kahn 1978
	"The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station." Kahn 1978 at 1477. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "A renewal point is a PR along the route of a packet where the route (as specified in its header) may be altered. In point-to-point routing, the header contains fields which identify the next few designated repeaters along the path to a specified destination. Every repeater on a point-to-point route can act as a renewal point where these fields are rewritten. Two reasons for identifying more than just the next repeater in the header are to allow a detour via an alternate repeater in the event of failures along the designated path and to allow some repeaters not to serve as renewal points. The detour must be such that it eventually rejoins the designated path. To function as a renewal point for a point-to-point route, a repeater must have a renewal table containing the next few designated repeaters for that route. When a packet arrives at the next downstream repeater for relaying, its routing fields are rewritten in the header according to the current renewal table entries. To conserve table space, each repeater maintains, at most, one table entry for each source/destination PR pair. In addition, the table must identify the last few upstream repeaters on the path so that the source can be notified in the event of communication failures at any point of the path." Kahn 1978 at 1482.

The '496 Patent – Claims	Kahn 1978
	"A packet may also contain an entire path of route selectors in the text of the packet. This case may be distinguished by a special bit in the packet header which indicates that the text contains all the route selectors. Such a packet is known as a route setup packet and is used to initialize or refresh the renewal table entries in each repeater. Upon receipt of a route setup packet, a repeater extracts the renewal table information (normally a few entries) from the entire list of selectors in the text and writes it into the renewal table. The contents of a route setup packet are normally inserted by the digital unit of the destination PR. Any packet may be a route setup packet, subject only to the maximum packet length constraints of the network. A route setup packet may also contain data." Khan 1978 at 1482. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net

The '496 Patent – Claims	Kahn 1978
	and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio, summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "Normal store-and-forward operation within the network takes place as follows. A user generated packet with associated addressing and control information in the packet header is input to the digital section of his packet radio, which adds some network routing and control information and passes the packet to the radio section for transmission to a nearby repeater which is identified within the packet. Upon correct receipt of the packet, the nearby repeater processes the header to determine if it should relay the packet, deliver it to an attached device, or discard it. Several nearby repeaters may

The '496 Patent – Claims	Kahn 1978
	actually hear the packet, but only one repeater (which we call the next downstream repeater) will typically be identified to relay it. The other repeaters, will discard the packet. The packet will then be relayed from repeater to repeater through the backbone (in a store-and-forward fashion using the procedure described above) until it arrives at the final repeater which broadcasts it directly to the user's packet radio. At each repeater, the packet is stored in memory until a positive acknowledgment is received from the next downstream repeater or a time-out occurs." Kahn 1978 at 1477. "Received packets are buffered in one of the receiver's descramblers prior to bit reordering and storage of the packet in processor memory under control of a DMA channel. Two receive descrambler/DMA channels are provided to allow reception of two successive packets with minimum interpacket arrival time." Kahn 1978 at 1492. Kahn 1978 at 1480 (Fig. 9):

Exhibit B1 – Invalidity Chart for Brownrigg Family based on Kahn 1978

The '496 Patent – Claims	Kahn 1978
	 Fig. 9. Point-to-point and broadcast routing.
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"The functions of a station are associated with global management of the radio net [24] . Generally speaking, each station is aware of all operational radios in the network. The stations discover the existence of new radios waiting to enter the net and determine when other radios have departed. The station determines the route to each of these radios and plays an active role in initializing, organizing, and maintaining the operational network. In particular, all routes are assigned by the station to minimize PR cost and complexity. PR's are not required to store information about every other PR and terminal device in the network. One of the requirements for controlling the PRNET is assessing the reliability of radio links between PR 's and using the information to assign good routes. A primary source of link information is the PR neighbor table whose entries are collected by each radio,

The '496 Patent – Claims	Kahn 1978
	summarized, and regularly sent to the station along with other status information. For example, each radio reports which other radios it can hear along with raw or processed information for the station to determine the quality of the transmission path between these radios. The station then deduces the overall connectivity of the network (we assume topologically rather than topographically) and determines good routes to itself from each of the radios in its subset. The station then distributes to each radio in its subset the route from that radio to the station. This process is known as labeling. The neighbor table is maintained by each PR whether or not an operational station is present and can be used in a stationless mode if necessary." Kahn 1978 at 1477. "In the event that one or more stations are available in the net and a point-to-point route fails (e.g., an intermediate repeater fails) the existing traffic on that route can be diverted to the station for forwarding to the final destination. The station must recompute a good route to the destination before it can forward the packet. Alternate routing is performed by the PR, when necessary, using parameters assigned by the station. Multiple receivers are allowed to forward a packet around a failed temporarily inaccessable repeater." Kahn 1978 at 1479-80. "As network conditions change (terminal movement, repeater failure or recovery, changes in hop reliability, and changes in network congestion) routes will be dynamically reassigned by the station to satisfy the minimum-delay criteria." Kahn 1978 at 1480. "If there was an operational station on the net, the PR's would send summary ROP's directly to the station at appropriate times (on a point-to-point route) to convey the current labeling information and also the neighbor table information. This is done both periodically and upon detection by the PR of a possibly significant change in

The '496 Patent – Claims	Kahn 1978
	some link." Kahn 1978 at 1481. "3) System Monitoring: Once initialized, each packet radio in the network periodically announces its existence by transmitting to the station summary ROP's which contain neighbor tables and other status information. Similarly, terminal devices periodically send summary TOP's (terminal-on packets), which serve much the same function as their counterpart summary ROP's. Both the station and the network monitor make extensive use of summary ROP's and TOP's. The station maintains a connectivity matrix based on the information contained in the ROP's for assigning routes. Current network connectivity may be displayed at the station upon request, and all state changes for nodes and links may be time stamped and logged. When active, the independent network monitoring system also listens to ROP's, and maintains a table of the last time that ROP's and TOP's were heard, for each packet radio or terminal interface unit ID. Thus, the exact time of failure of any network element can be obtained-even if a component of the station fails." Kahn 1978 at 1494.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The Jubin References include descriptions relating to distributed routing in a radio network. The references include:

1. Jubin, J. and Tornow, J., "The DARPA Packet Radio Network Protocols"; Proceedings of the IEEE, Vol. 75, No. 1, (Jan. 1987) (Jubin and Tornow)
2. Jubin, John, "Current Packet Radio Network Protocols" IEEE 1985 (Jubin 1985)

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	The Jubin References
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow

The '516 Patent – Claims	The Jubin References
network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

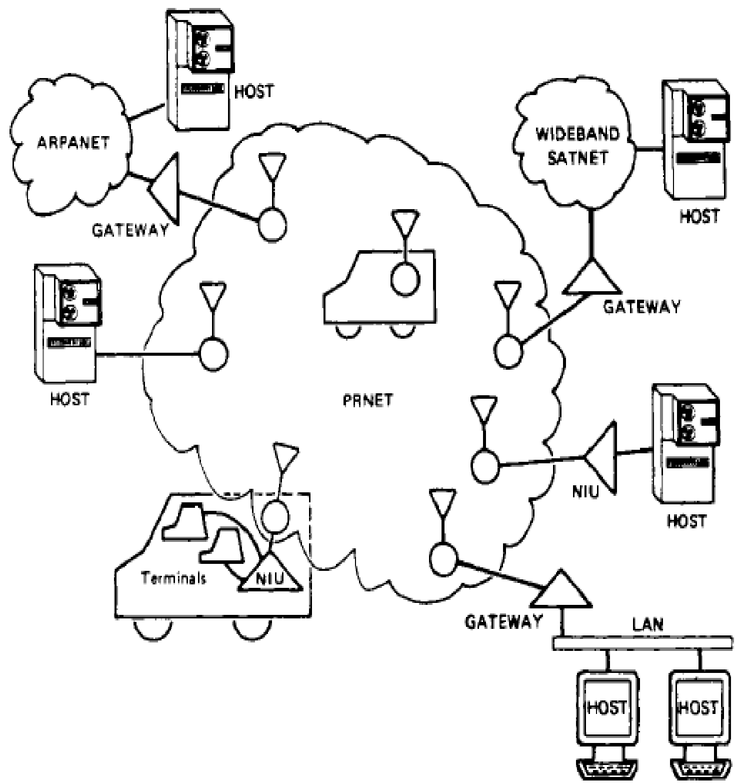
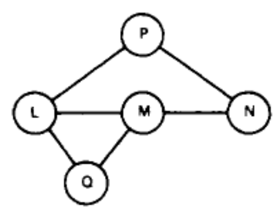
The '516 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '516 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '516 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

"Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in

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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
2. A server as recited in claim 1, wherein the second network is a	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the

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TCP/IP protocol network.	DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.

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5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "One special type-of-service is offered to users. It provides lower delay, and thus higher throughput, but less reliability and was designed primarily for packetized speech. A user can invoke speech type-of-service on a packet-by-packet basis via the speech type-of-service flag in the ETE header." Jubin and Tornow at 30.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium,

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for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and

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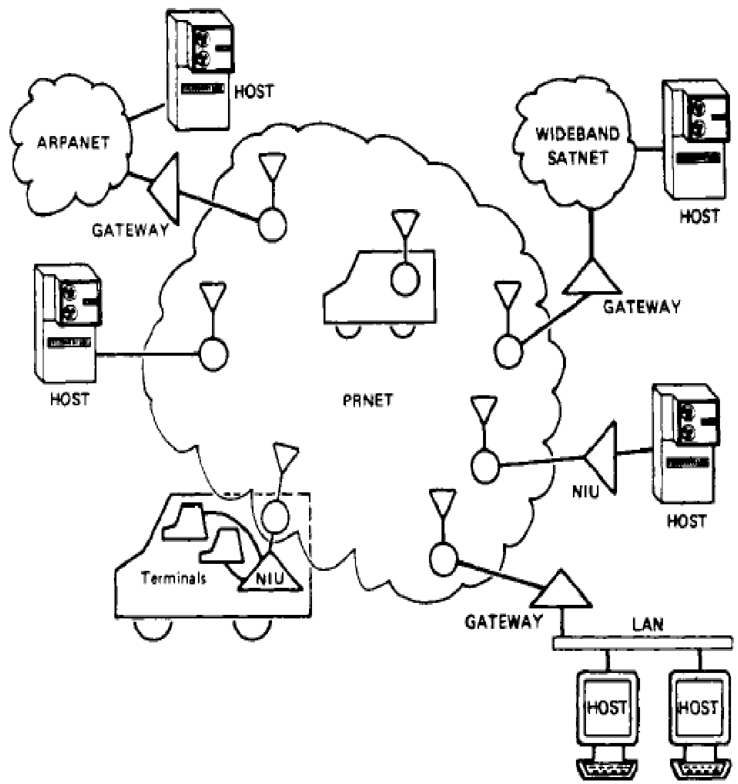
	terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '516 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

<table>
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<tr><td></td><td>
"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23.

"[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25.

"If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25.

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"In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22.

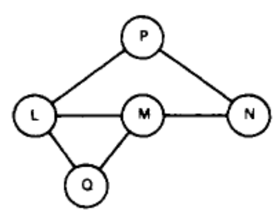
Fig. 2:


Fig. 2. Small packet radio network.
</td></tr>
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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "One special type-of-service is offered to users. It provides lower delay, and thus

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changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2

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least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier

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11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.
13. A method as recited in claim 10	"The PRNET features fully distributed network management. Each packet radio

<table>
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<tr><td>further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.</td><td>gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
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Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

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The '516 Patent – Claims	The Jubin References
	bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

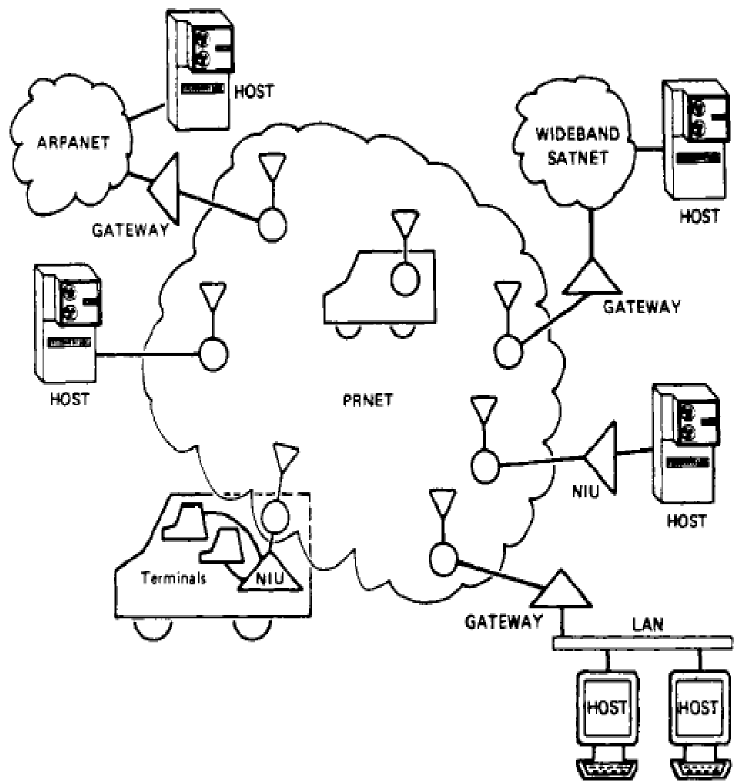
The '516 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25.

The '516 Patent – Claims	The Jubin References
	"We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	The Jubin References
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and

The '314 Patent – Claims	The Jubin References
	application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '314 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

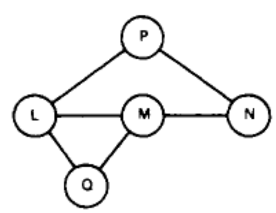
The '314 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '314 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '314 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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The '314 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

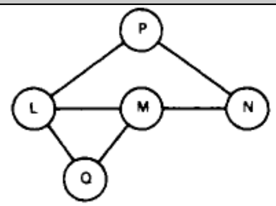
<table>
<tr><th>The ‘314 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td></td><td>

Fig. 2. Small packet radio network.

“In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway.” Jubin and Tornow at 22-23.

“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.</td></tr>
</table>

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '314 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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The '314 Patent – Claims	The Jubin References
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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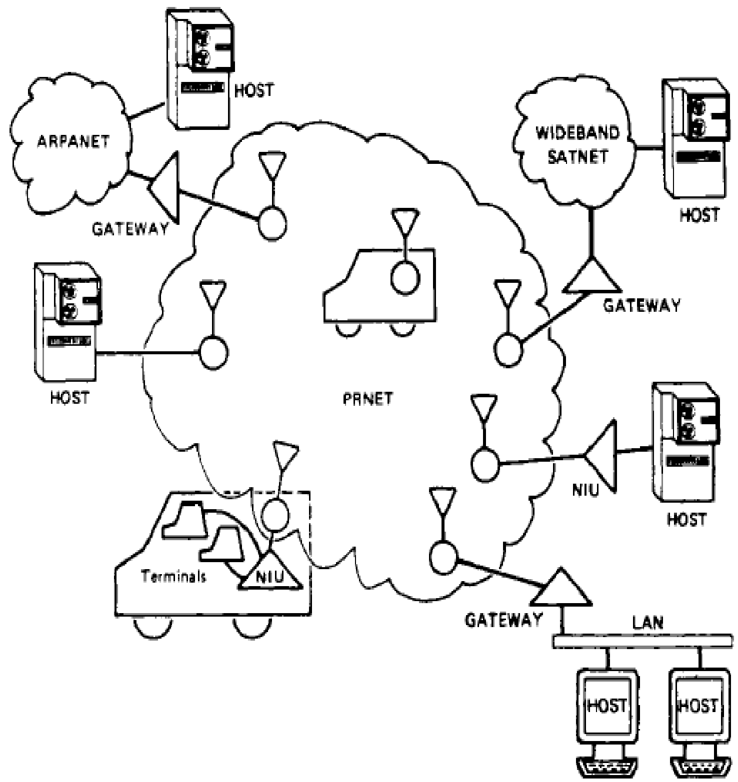
	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises:

The '314 Patent – Claims	The Jubin References
sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	• The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '314 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

<u>**Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References**</u>

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	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	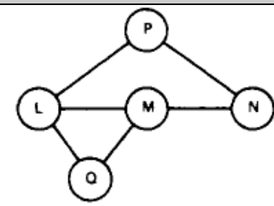 **Fig. 2.** Small packet radio network. "Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a

The '314 Patent – Claims	The Jubin References
	strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same

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a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the

The '314 Patent – Claims	The Jubin References
the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24.

The '314 Patent – Claims	The Jubin References
	"Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish

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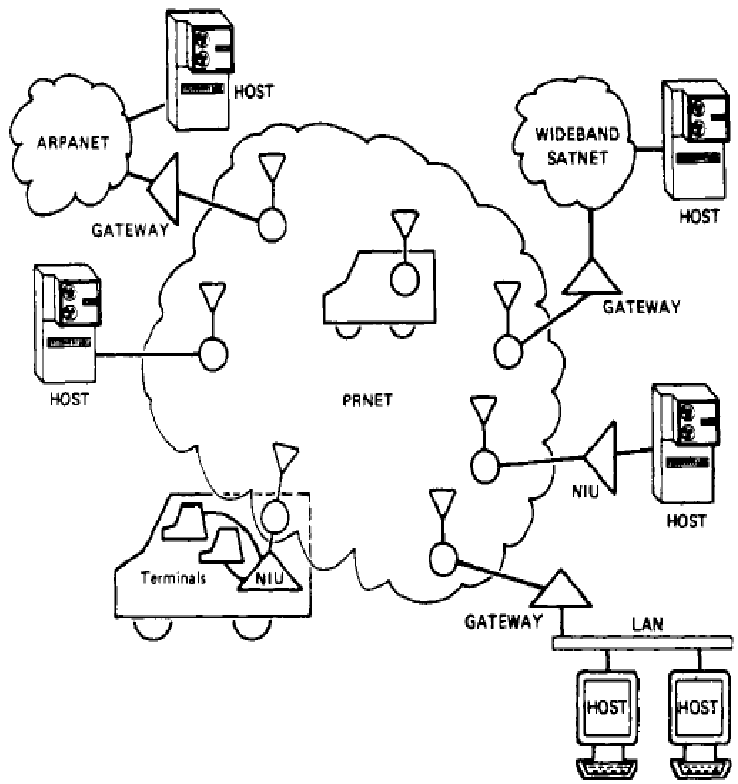
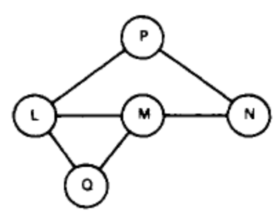
	to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '314 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

The '314 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '314 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	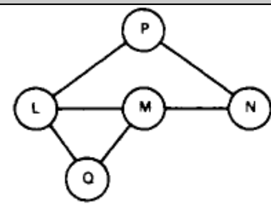 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

The '314 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

The '314 Patent – Claims	The Jubin References
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network;	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises:

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a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	• The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	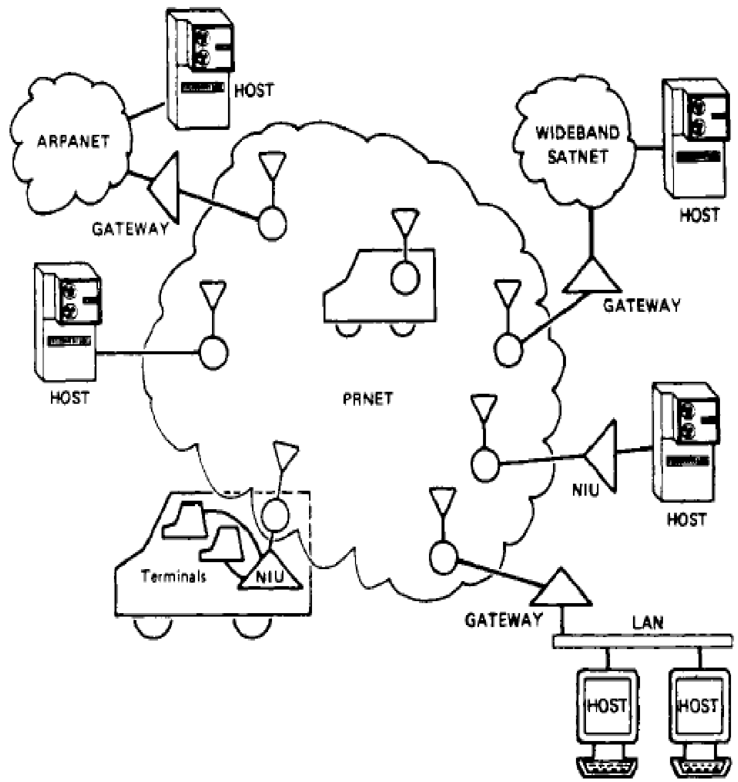 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	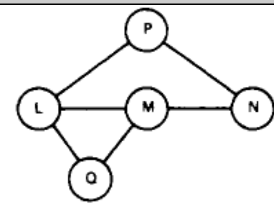 **Fig. 2.** Small packet radio network. "Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a

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	strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same

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said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

<table>
<tr><th>The '314 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>said first network to said first node can be through one or more of other second node of said first network;</td><td>
"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.
Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR N.
"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.
"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the
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	network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

The '314 Patent – Claims	The Jubin References
nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link

The '314 Patent – Claims	The Jubin References
	conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the

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	network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important

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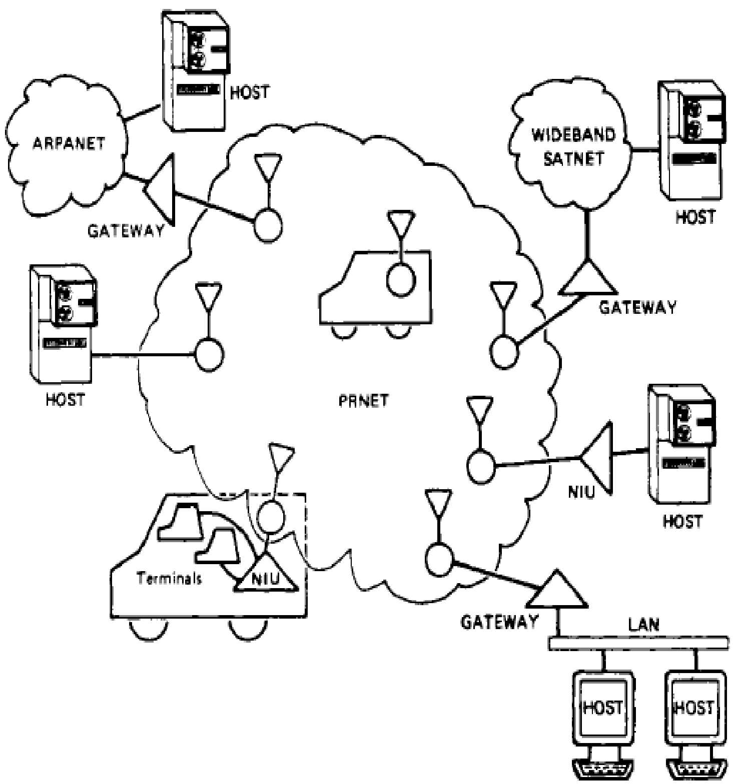
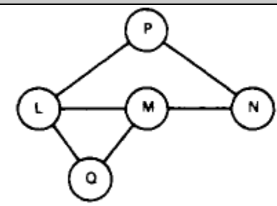
said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via

The '314 Patent – Claims	The Jubin References
	an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):  Fig. 4. Packet radio network in the Internet.

The '314 Patent – Claims	The Jubin References
	"The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23. "[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '314 Patent – Claims	The Jubin References
	 **Fig. 2.** Small packet radio network. "Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a

The '314 Patent – Claims	The Jubin References
	strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same

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	time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the

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that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24.

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	"Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.

Invalidity Chart for U.S. Patent No. 8,233,471

The '471 Patent – Claims	The Jubin References
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and

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	application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	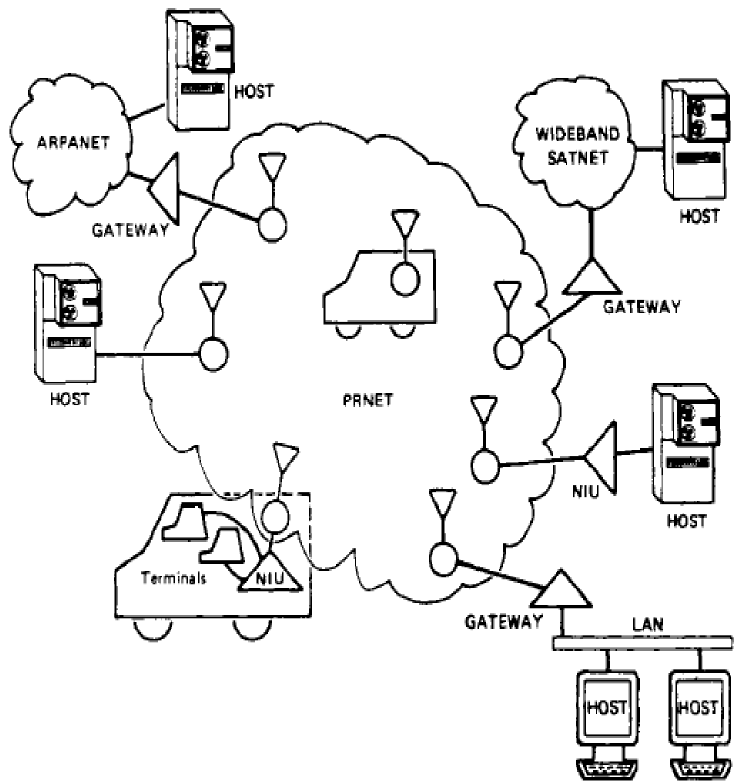 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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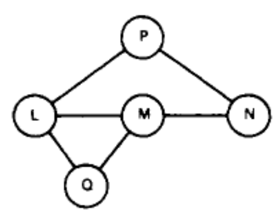
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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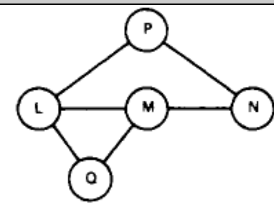
<table>
<tr><th>The '471 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td></td><td>

Fig. 2. Small packet radio network.

"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.

"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.</td></tr>
</table>

The '471 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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<tr><td>wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and</td><td>
“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.
“[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio].” Jubin and Tornow at 24.
Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
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Fig. 5. Typical tier table for PR N.
“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.
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wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25.

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	"We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one

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	(referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet

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a client wireless communication, maintaining a send/receive data buffer in digital memory, and	provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	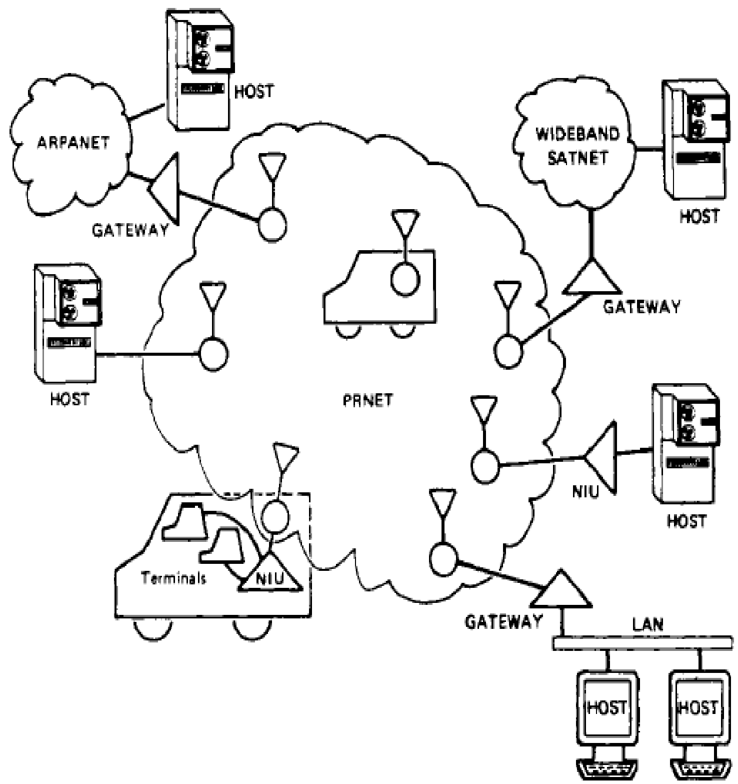 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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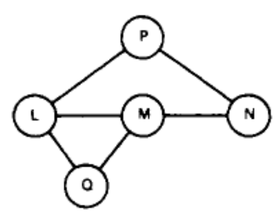
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	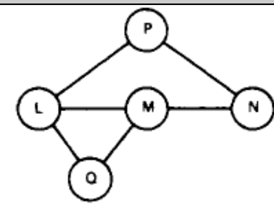 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one

The '471 Patent – Claims	The Jubin References
	(referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a

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buffer in digital memory, and	packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

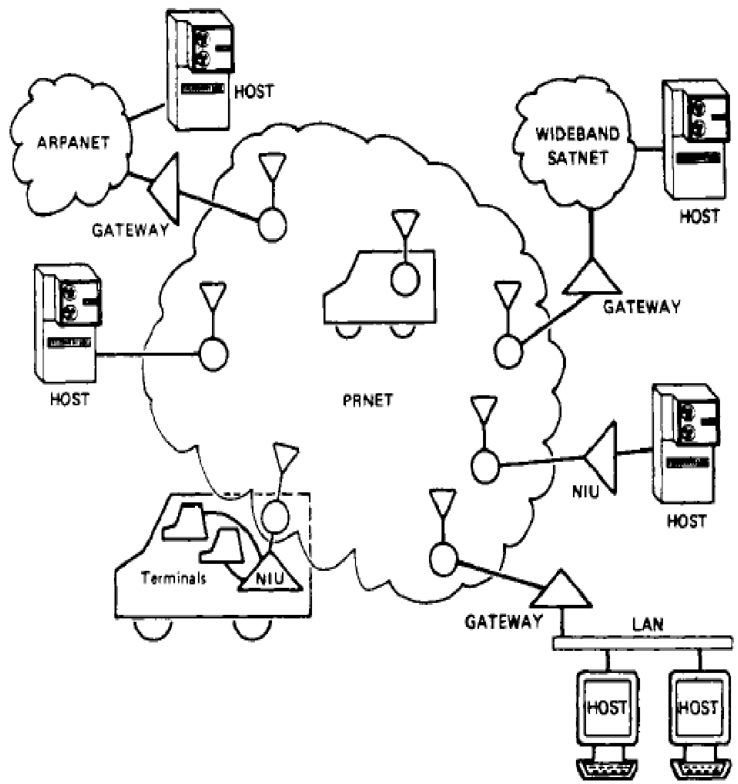
The '471 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

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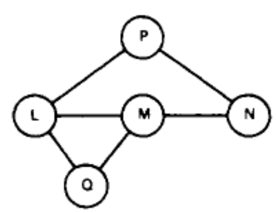
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '471 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

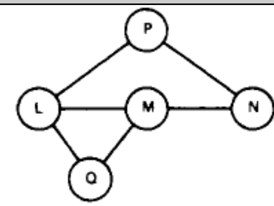
The '471 Patent – Claims	The Jubin References
	 Fig. 2. Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated

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	automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier

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	tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
14. A method for providing wireless network communication comprising the steps of: a server process including a data	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21.

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packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required

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	protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

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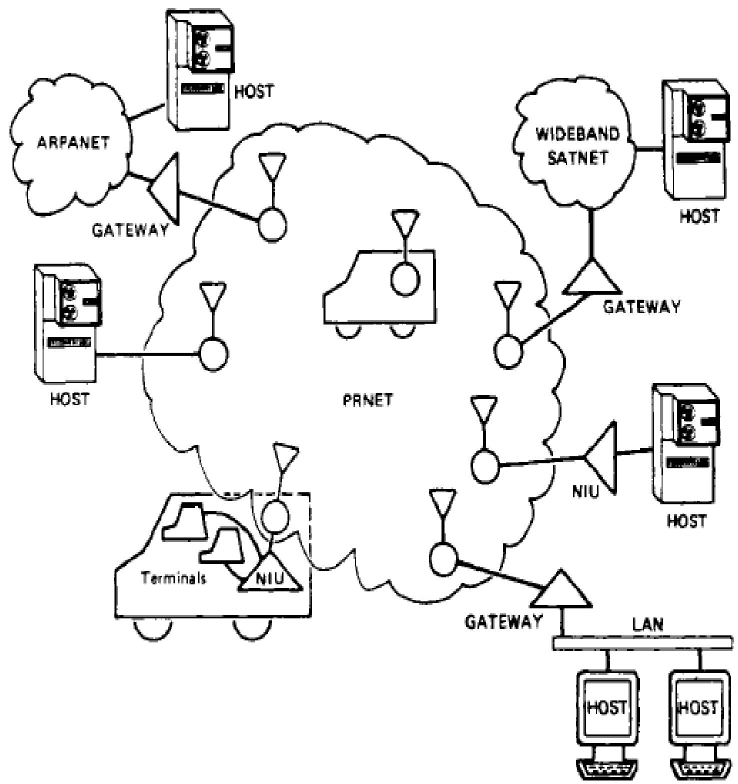
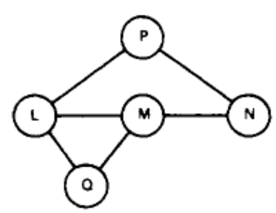
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

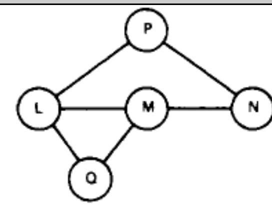
The '471 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '471 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '471 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

The '471 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
	 Fig. 2. Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

The '471 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '471 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The '471 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and</td><td>
"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR N.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in
</td></tr>
</table>

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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '471 Patent – Claims	The Jubin References
provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25.

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	"We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one

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	(referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a

The '471 Patent – Claims	The Jubin References
that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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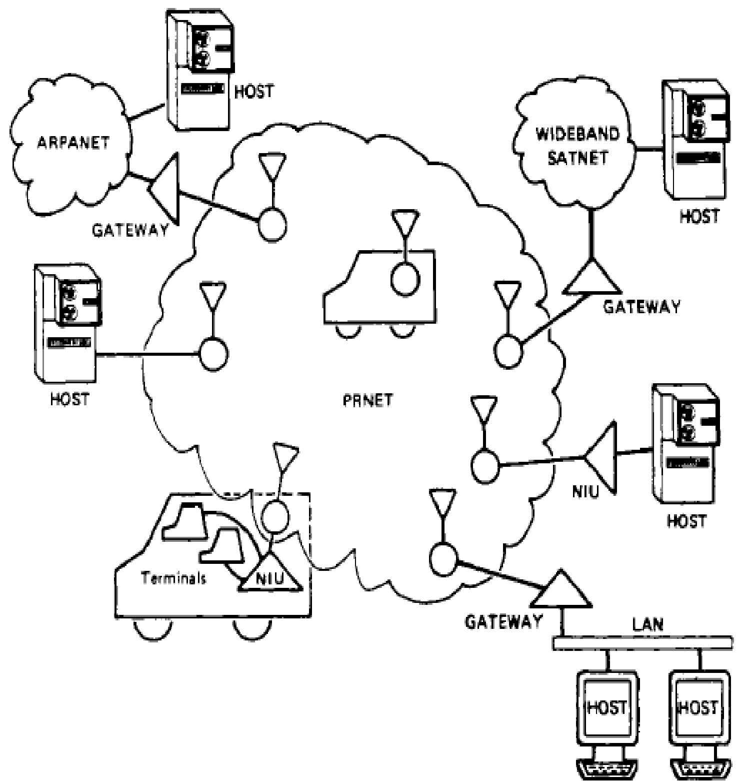
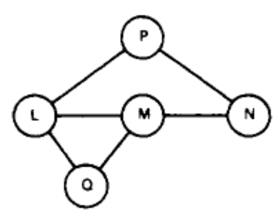
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '471 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '471 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

The '471 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	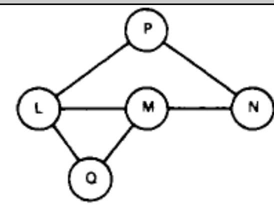 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

The '471 Patent – Claims	The Jubin References
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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The '471 Patent – Claims	The Jubin References
	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier

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	tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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<table>
<tr><th>The '471 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td></td><td></td></tr>
<tr><td>20. A wireless system comprising:
a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions;
a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and</td><td>"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21.

"The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21.

"The PRNET system comprises:

• The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[;
• The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22.

"[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22.

"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the</td></tr>
</table>

The '471 Patent – Claims	The Jubin References
	end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

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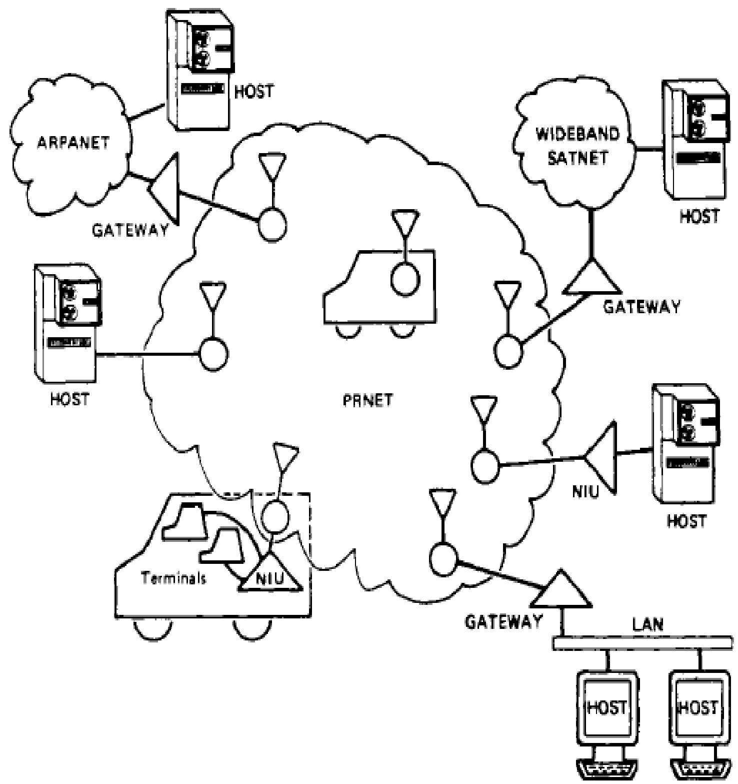
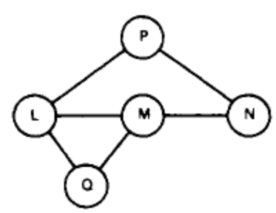
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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The '471 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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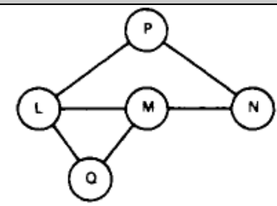
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

The '471 Patent – Claims	The Jubin References
	 Fig. 2. Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '471 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The ‘471 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.</td><td>“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.

“[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio].” Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>

Fig. 5. Typical tier table for PR *N*.

“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.

“Another host computer function called the Network Monitor is used to aid in</td></tr>
</table>

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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table.

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second node link tree when said comparison meets predetermined conditions.	These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24.

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22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host

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	computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	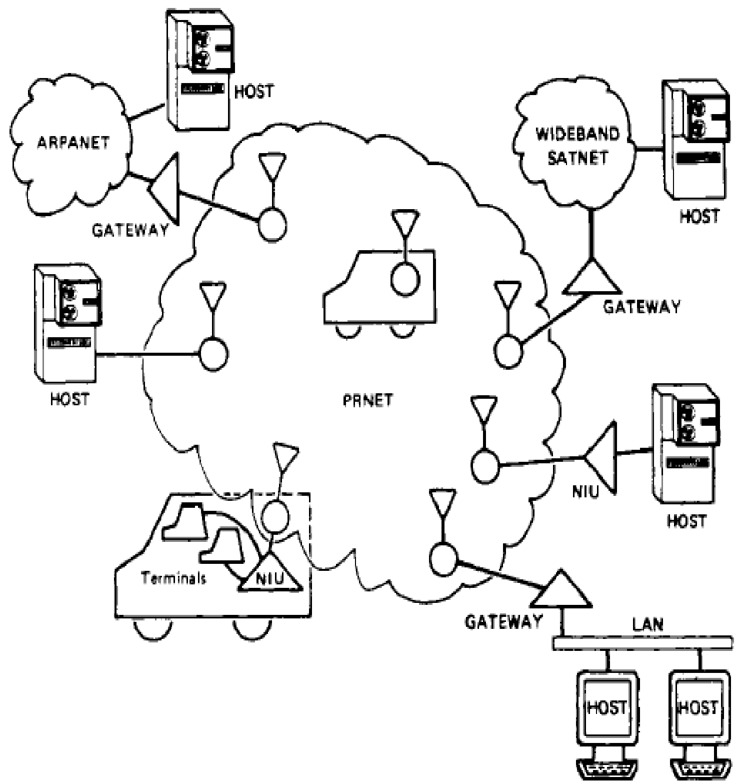 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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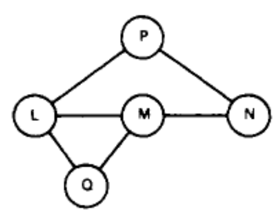
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '471 Patent – Claims	The Jubin References
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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	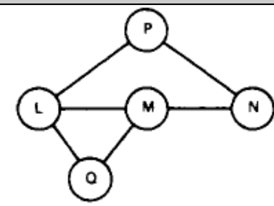 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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<tr><td>the first node process further comprises maintaining a second node link tree having second node link entries.</td><td>"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in</td></tr>
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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table.

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tree when said comparison meets predetermined conditions.	These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24.

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	"Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host

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	computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	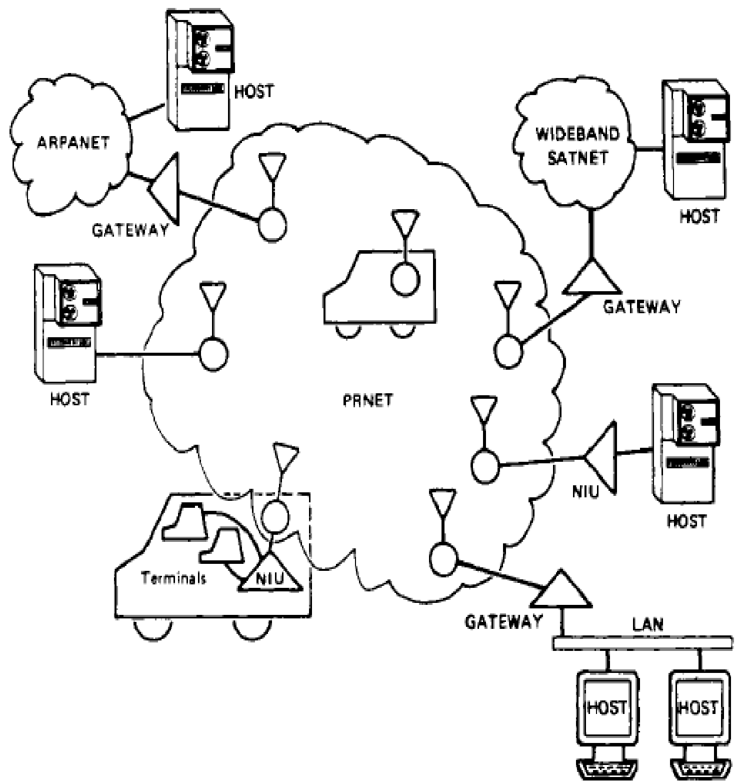 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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<table>
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<tr><td></td><td>"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23.

"[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25.

"If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25.

"In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25.

"In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22.

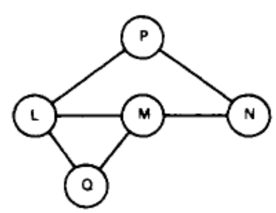
Fig. 2:


Fig. 2. Small packet radio network.</td></tr>
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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	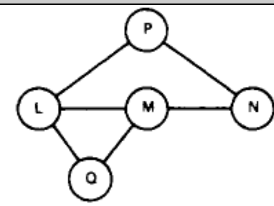 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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<tr><td>maintaining a second node link tree having second node link entries at the first node.</td><td>
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Fig. 5. Typical tier table for PR N.
"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.
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when said comparison meets at least one of several predetermined conditions.	These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24.

The '471 Patent – Claims	The Jubin References
	"Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications

The '471 Patent – Claims	The Jubin References
modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

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	Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

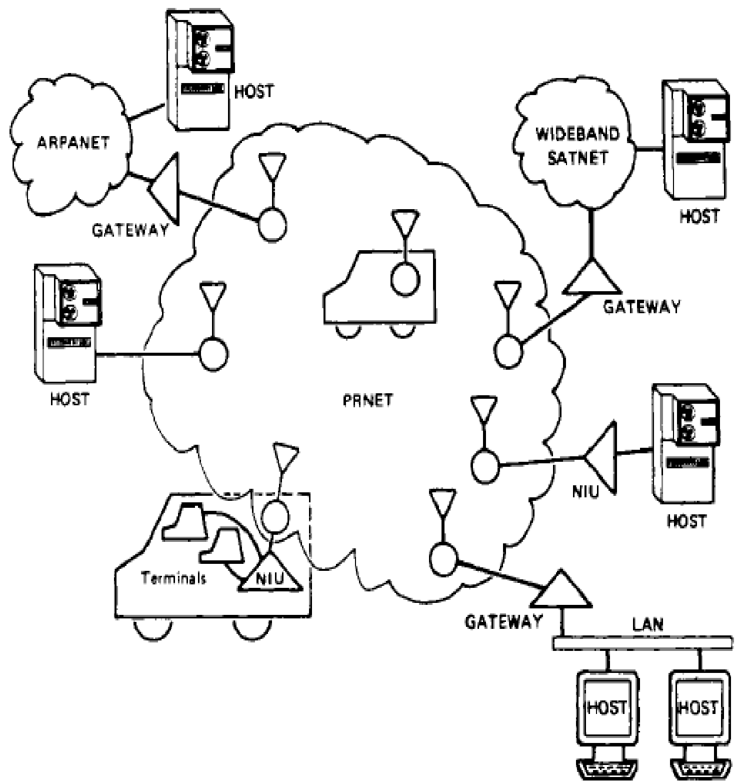
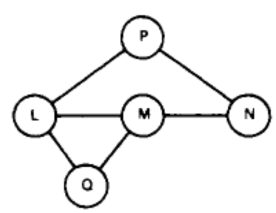
The '471 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '471 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '471 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '471 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and	"Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination

The '471 Patent – Claims	The Jubin References
send the optimized transmission path for each of the plurality of client nodes to the respective client node.	[packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the

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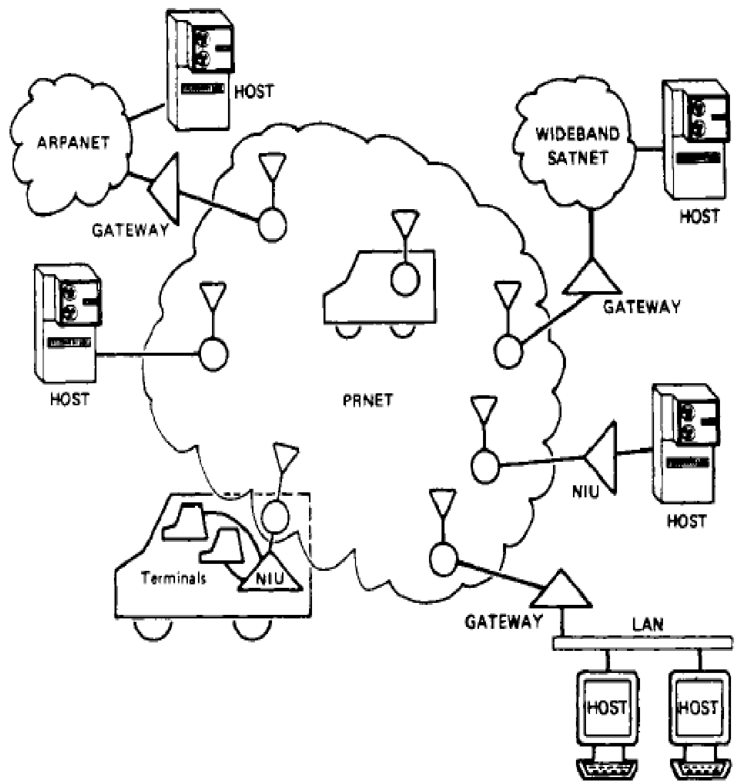
	LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	The Jubin References
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and

The '496 Patent – Claims	The Jubin References
	application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '496 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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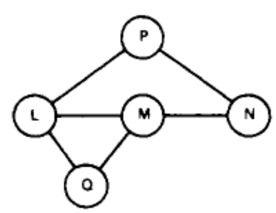
The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	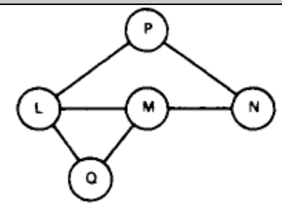 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '496 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The ‘496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>wherein the server process is configured to:
receive information identifying the selected transmission path from each of the plurality of clients;
determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients;
send information identifying the server selected transmission path for each of the clients to the respective clients; and
maintain a client link tree having client link entries representing each of the plurality of clients.</td><td>“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.

“[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio].” Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR *N*.

“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.

“Another host computer function called the Network Monitor is used to aid in</td></tr>
</table>

The '496 Patent – Claims	The Jubin References
	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21.

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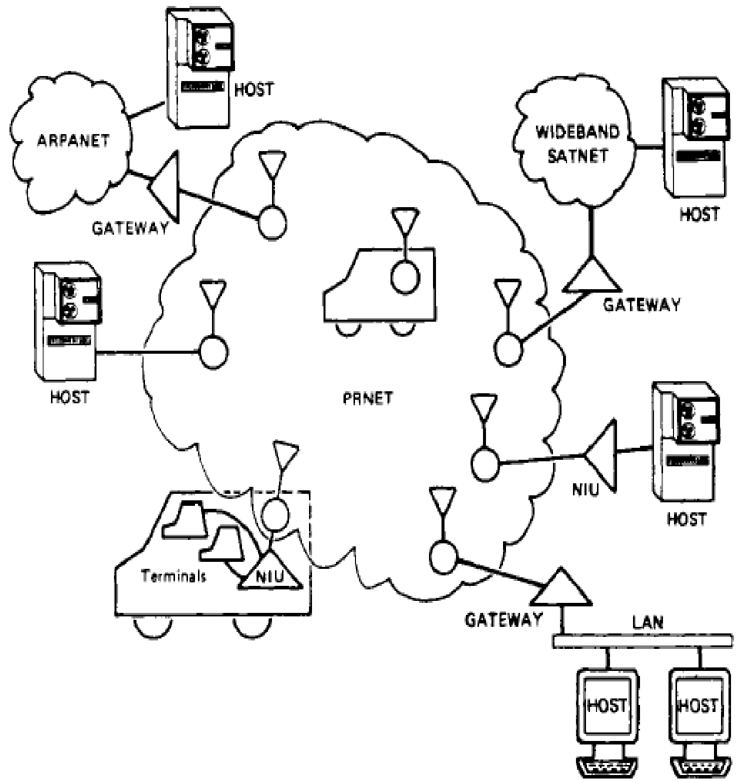
<tr><th>The ‘496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>server radio modem; and
a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,</td><td>“The PRNET system comprises:

• The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[;
• The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time.” Jubin and Tornow at 22.

“[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel.” Jubin and Tornow at 22.

“In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway.” Jubin and Tornow at 22-23.</td></tr>
</table>

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	Figure 4 (Jubin and Tornow at 23):  Fig. 4. Packet radio network in the Internet. “The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network.” Jubin and Tornow

The '496 Patent – Claims	The Jubin References
	at 23. "[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	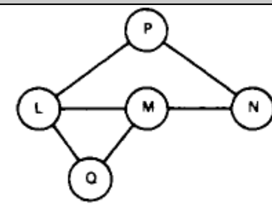 **Fig. 2.** Small packet radio network. "Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a

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	strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same

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	time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22.

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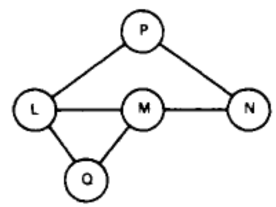
server through at least one the remainder of said plurality of clients,	"In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.

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	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the

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	PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it

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<tr><td></td><td>is attached;
- a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.</td></tr>
<tr><td>wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:
receive information identifying the selected transmission path from each of the plurality of clients,
determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and
send information identifying the server selected transmission path for each of the clients to the respective clients.</td><td>"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:

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Fig. 5. Typical tier table for PR *N*.</td></tr>
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	PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a

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	new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

<table>
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<tr><td>tree if said client is authentic and is not already in said client link tree.</td><td></td></tr>
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<tr><td>5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.</td><td>"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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Fig. 5. Typical tier table for PR *N*.

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7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium,

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communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and

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Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

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	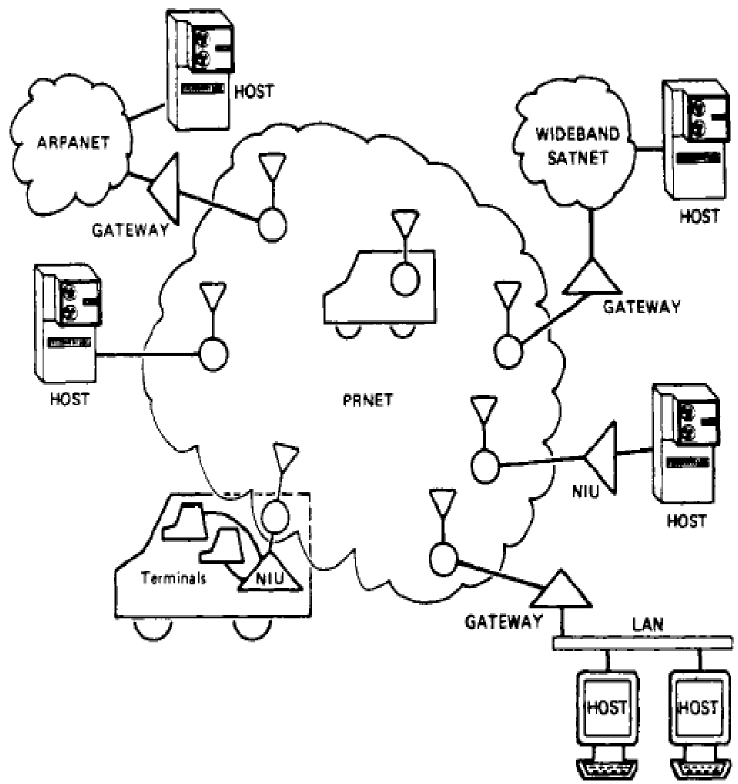 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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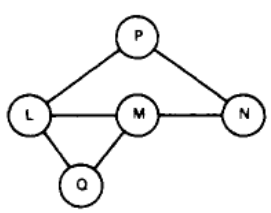
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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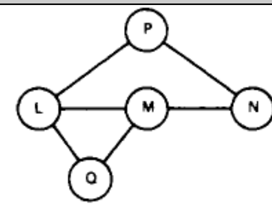
<tr><td></td><td>

Fig. 2. Small packet radio network.

"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.

"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.</td></tr>
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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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<tr><td>wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:</td><td>

"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
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Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in

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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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send information identifying the server selected transmission path for each of the clients to the respective clients.</td><td>
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Fig. 5. Typical tier table for PR N.

“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.

“Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network.” Jubin and Tornow at 23.

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8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M

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	• as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

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	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	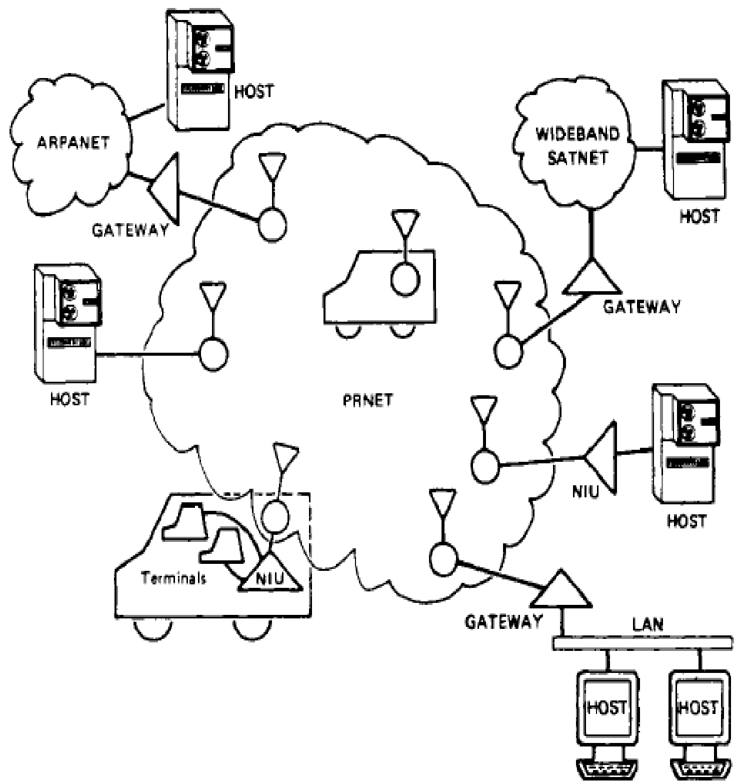 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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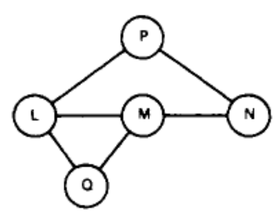
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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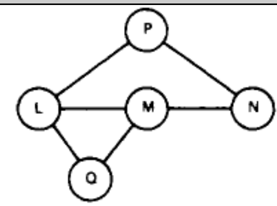
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

The '496 Patent – Claims	The Jubin References
	 Fig. 2. Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '496 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The ‘496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>wherein the server process:
receives information identifying the selected transmission path from each of the plurality of clients,
determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients,
sends information identifying the server selected transmission path for each of the clients to the respective clients; and</td><td>“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.

“[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio].” Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR *N*.

“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.

“Another host computer function called the Network Monitor is used to aid in</td></tr>
</table>

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	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '496 Patent – Claims	The Jubin References
	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

The '496 Patent – Claims	The Jubin References

TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

"Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

The '496 Patent – Claims	The Jubin References
	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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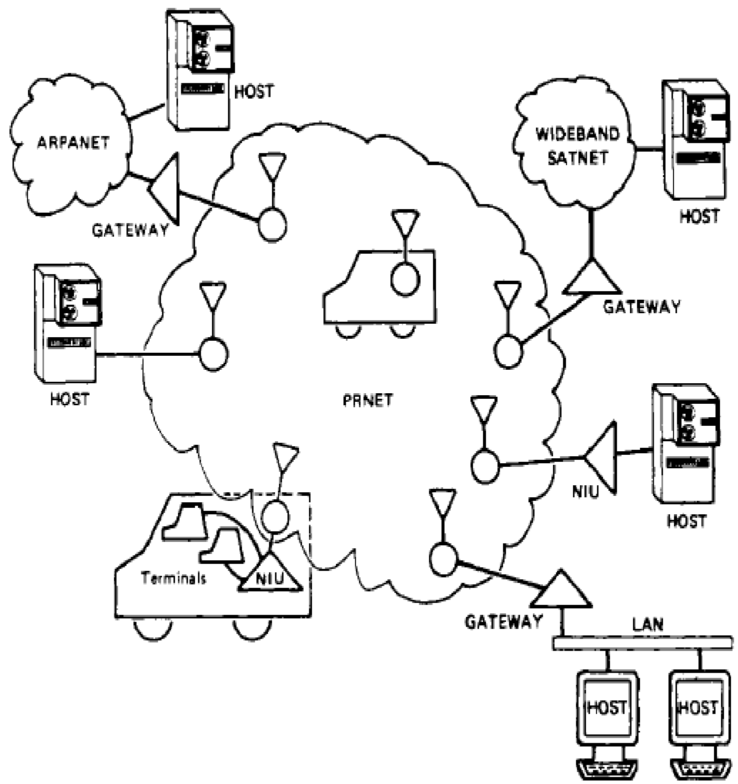
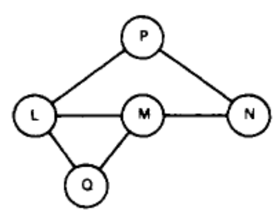
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
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	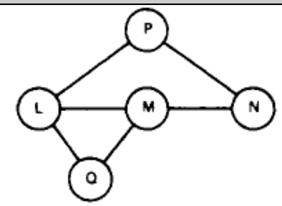 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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<tr><td>wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:</td><td>
"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.
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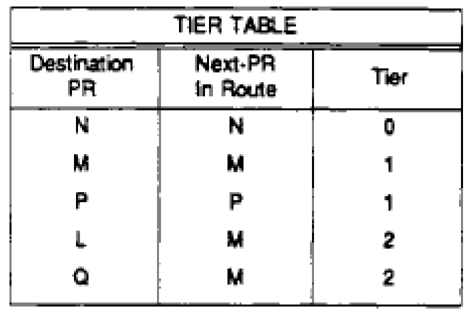
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<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
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Fig. 5. Typical tier table for PR N.
"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.
"Another host computer function called the Network Monitor is used to aid in
</td></tr>
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Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	TIER TABLE Destination PR / Next-PR In Route / Tier N / N / 0 M / M / 1 P / P / 1 L / M / 2 Q / M / 2 **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M

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	• as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

The '496 Patent – Claims	The Jubin References
	TIER TABLE | Destination PR | Next-PR in Route | Tier | | N | N | 0 | | M | M | 1 | | P | P | 1 | | L | M | 2 | | Q | M | 2 | **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

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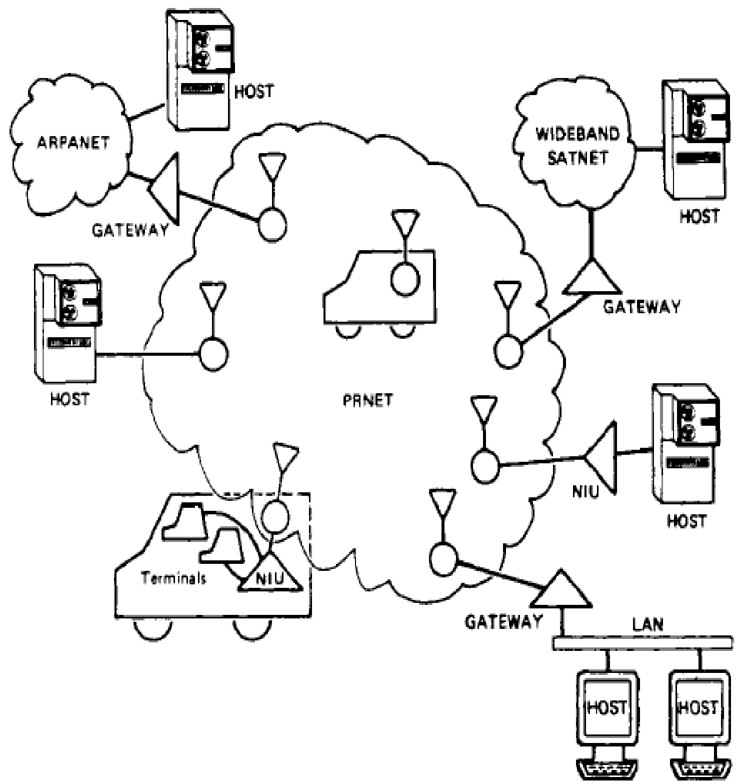
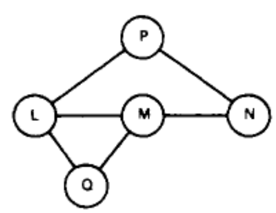
	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '496 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	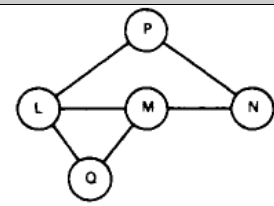 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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<tr><td>wherein the server process:
receives information identifying the selected transmission path from each of the plurality of clients,
determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients,
sends information identifying the server selected transmission path for each of the clients to the respective clients; and</td><td>“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.

“[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio].” Jubin and Tornow at 24.

Fig. 5:

<table><tr><th colspan="3">TIER TABLE</th></tr><tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr><tr><td>N</td><td>N</td><td>0</td></tr><tr><td>M</td><td>M</td><td>1</td></tr><tr><td>P</td><td>P</td><td>1</td></tr><tr><td>L</td><td>M</td><td>2</td></tr><tr><td>Q</td><td>M</td><td>2</td></tr></table>
Fig. 5. Typical tier table for PR *N*.

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maintains a client link tree having client link entries representing each of the plurality of clients.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
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P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

"Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

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	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	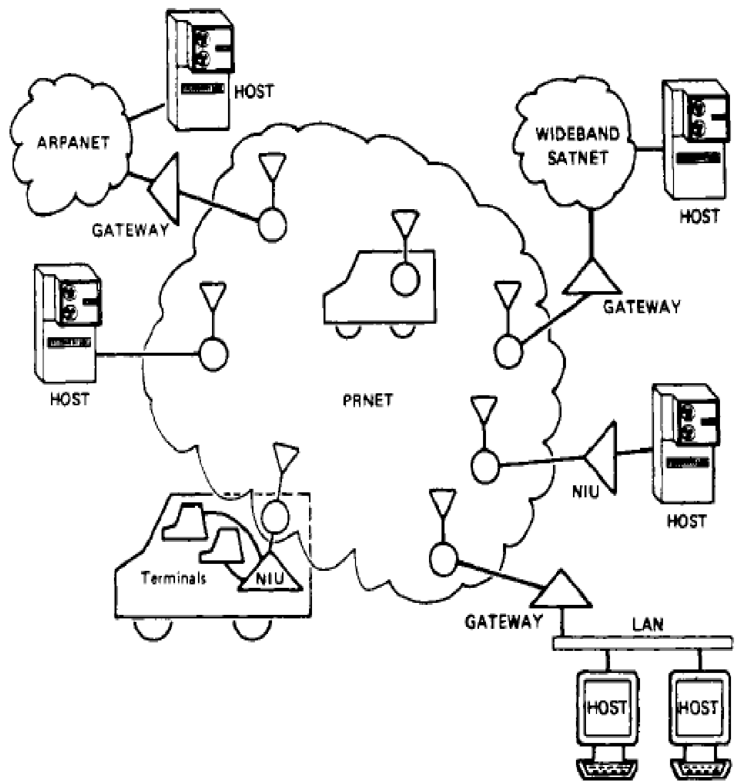 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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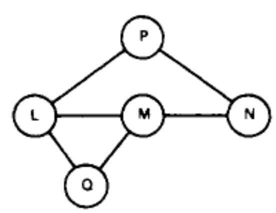
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	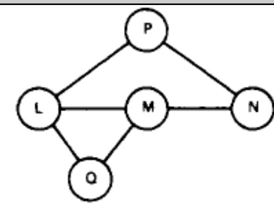 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and</td><td>"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.

Fig. 5:

<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in</td></tr>
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wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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<tr><td>provide the server selected transmission path, and
sends information identifying the server selected transmission path for each of the clients to the respective clients.</td><td>
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
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<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>

Fig. 5. Typical tier table for PR N.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M

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	• as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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	TIER TABLE | Destination PR | Next-PR In Route | Tier | | N | N | 0 | | M | M | 1 | | P | P | 1 | | L | M | 2 | | Q | M | 2 | **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

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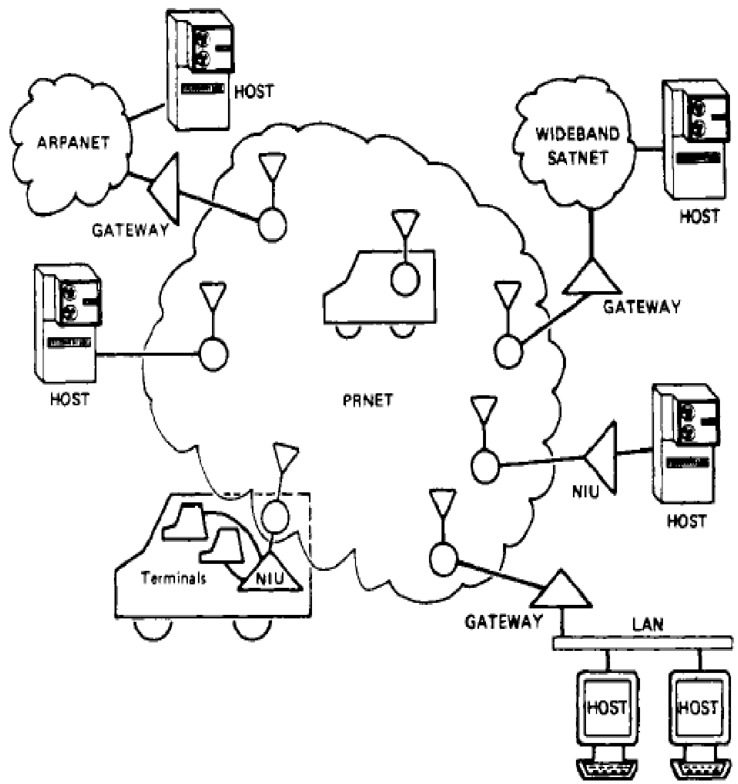
	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '496 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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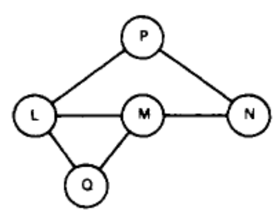
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	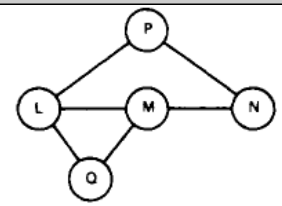 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.</td><td>
"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.
"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.
Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR N.
"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.
"Another host computer function called the Network Monitor is used to aid in
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	"After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table.

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node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24.

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23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and

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	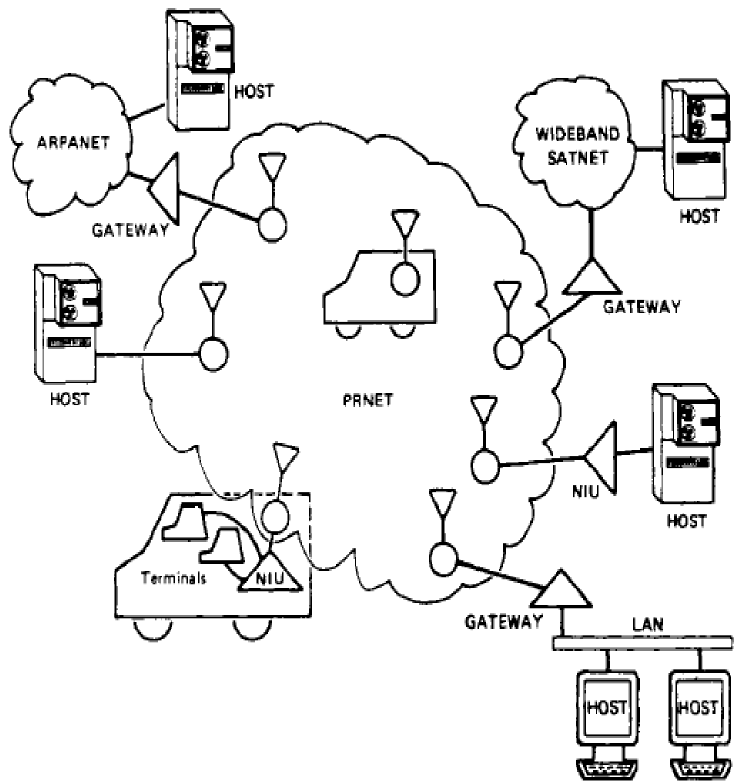 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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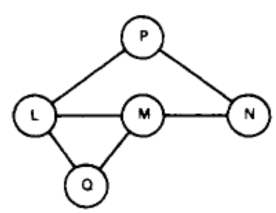
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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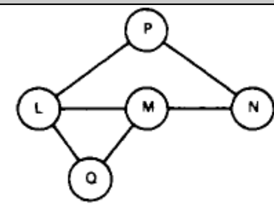
	 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

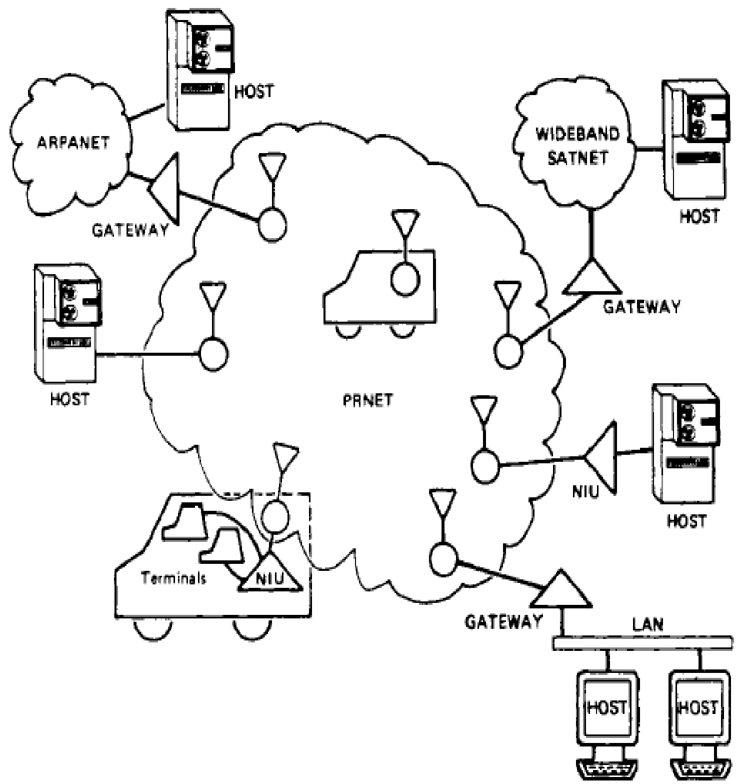
The '496 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

The '496 Patent – Claims	The Jubin References
	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

The '496 Patent – Claims	The Jubin References
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on

The '496 Patent – Claims	**The Jubin References**
	the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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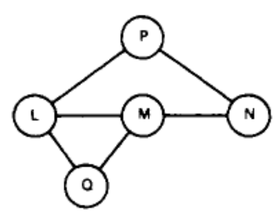
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

The '496 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

The '496 Patent – Claims	The Jubin References
	TIER TABLE Destination PR / Next-PR In Route / Tier N / N / 0 M / M / 1 P / P / 1 L / M / 2 Q / M / 2 **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td></td><td>

TIER TABLE

Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic

The '496 Patent – Claims	The Jubin References
	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M

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	• as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

The '496 Patent – Claims	The Jubin References
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21.

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the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	"The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required

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	protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	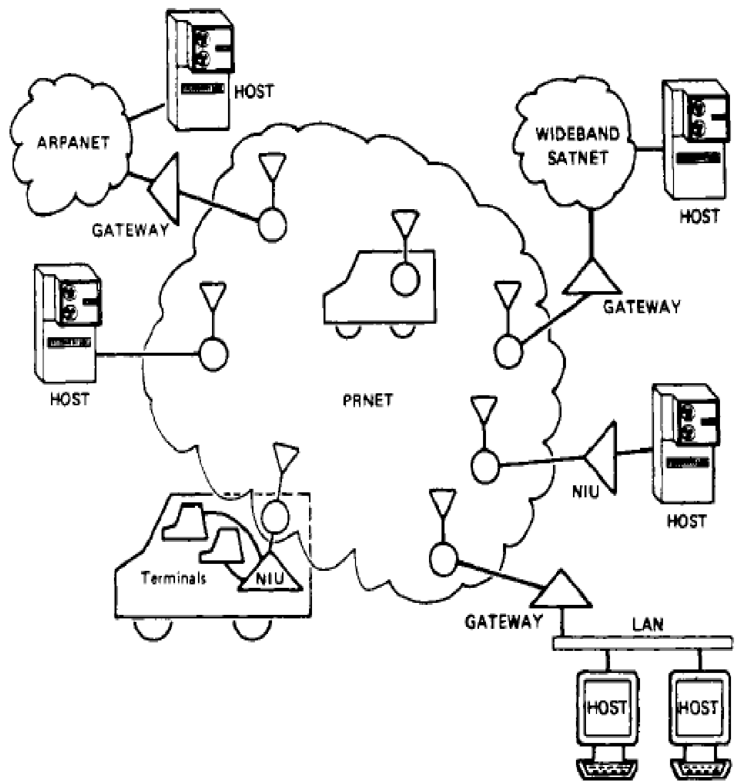 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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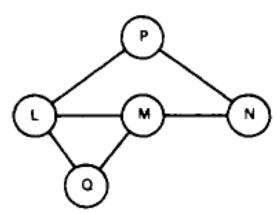
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References

TIER TABLE

Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

"Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow

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	at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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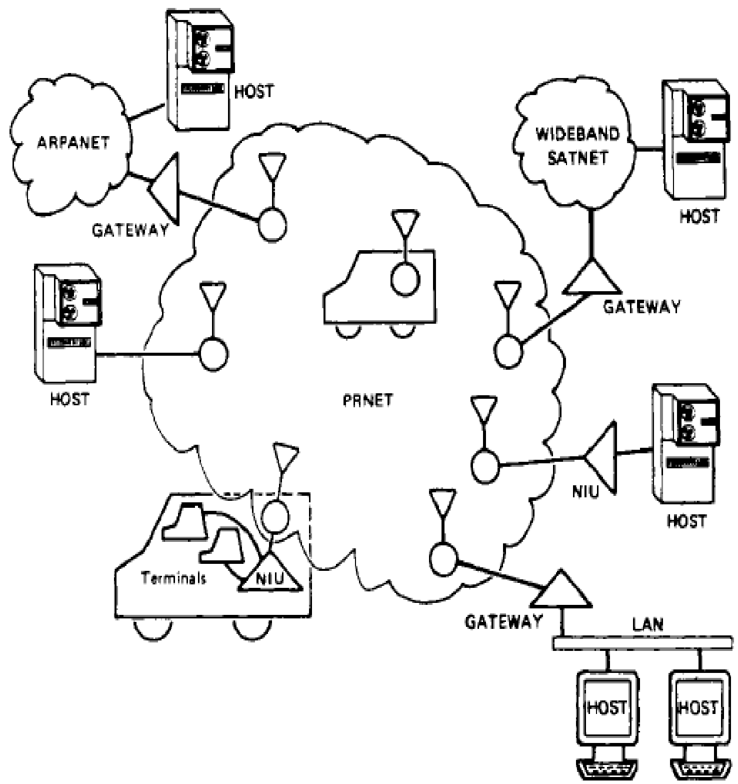
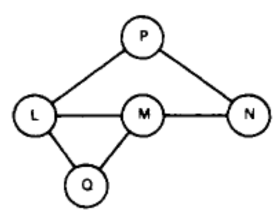
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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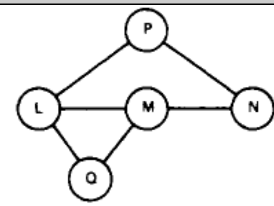

Fig. 2. Small packet radio network.

“In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway.” Jubin and Tornow at 22-23.

“The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination.” Jubin and Tornow at 23.
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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

The '496 Patent – Claims	The Jubin References
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the

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	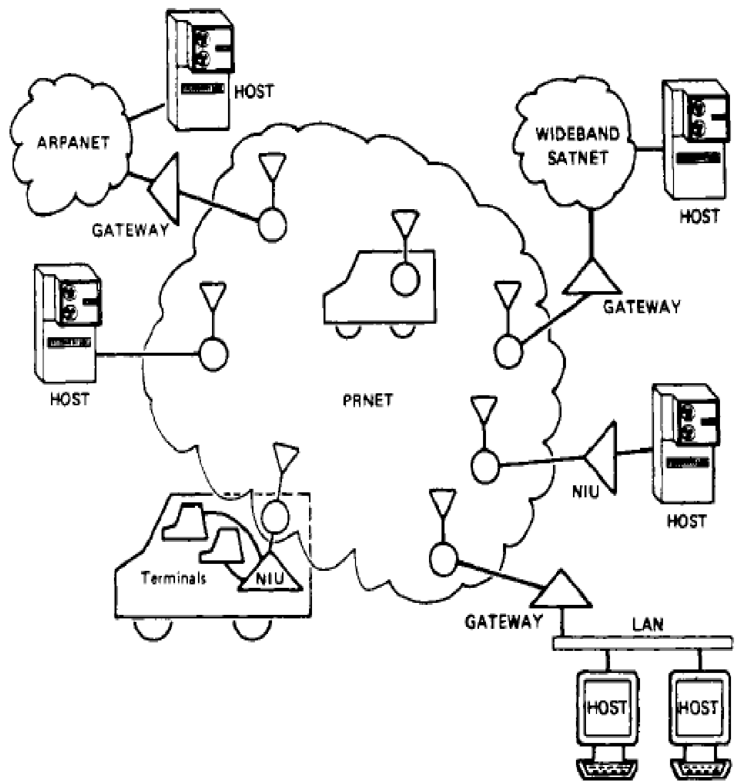 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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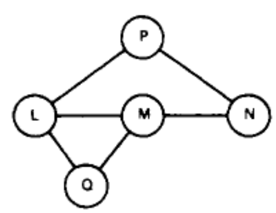
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	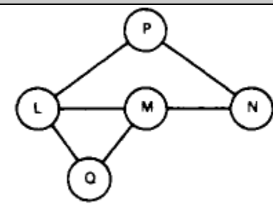 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on

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	the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	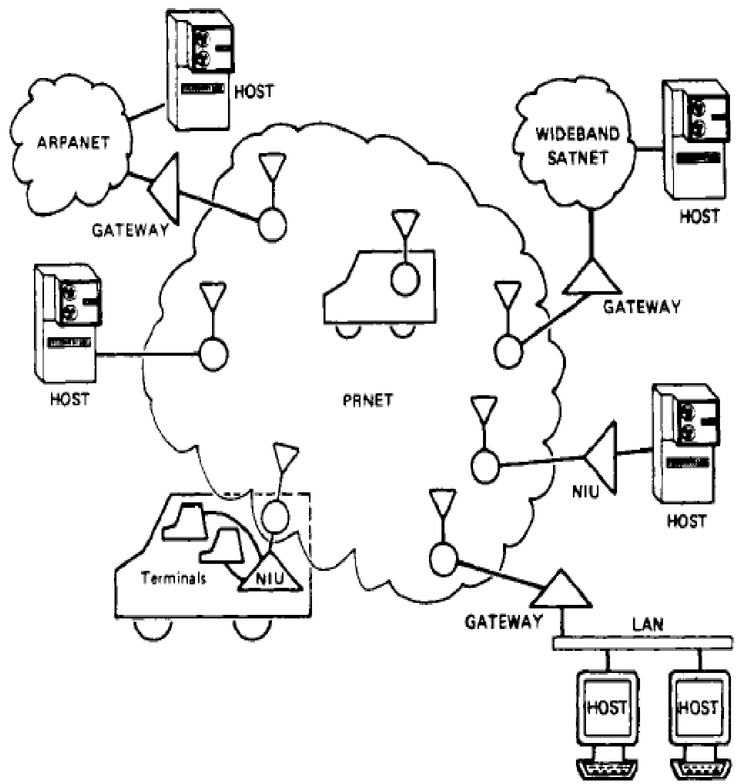 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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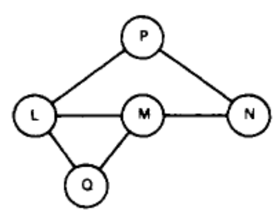
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

The '496 Patent – Claims	The Jubin References

TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

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34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M

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	• as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.

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35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises:

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<tr><td>node radio modem, and</td><td>

The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[;
The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22.

"[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22.
"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.
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	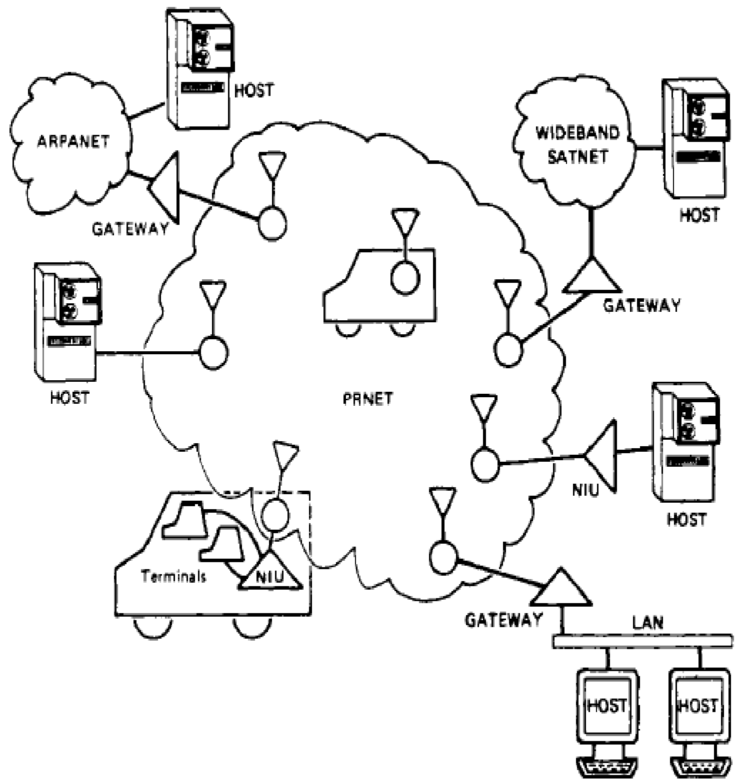 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	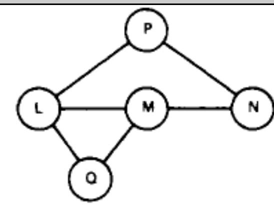 **Fig. 2.** Small packet radio network. "Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a

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Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
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Fig. 5. Typical tier table for PR N.
“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.
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	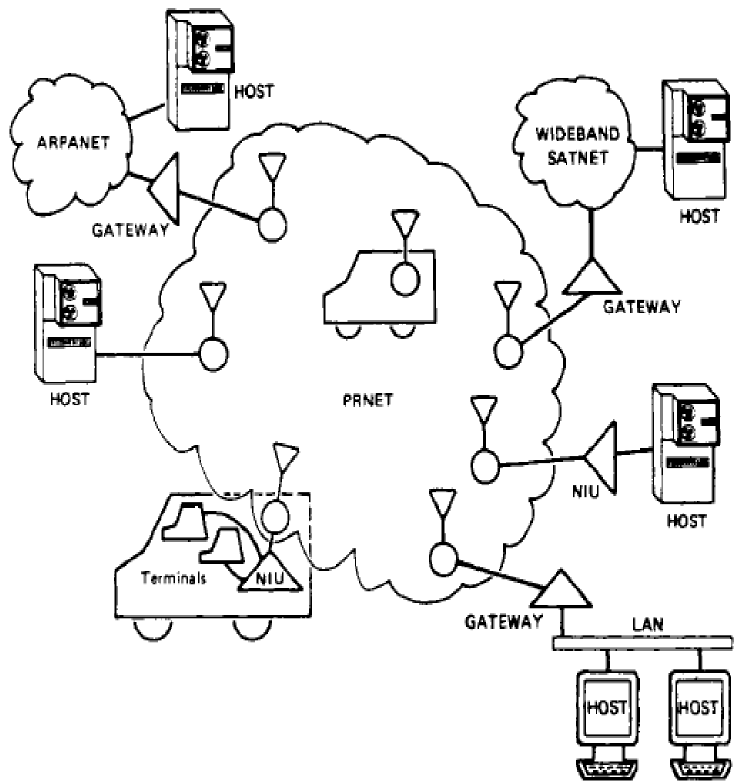 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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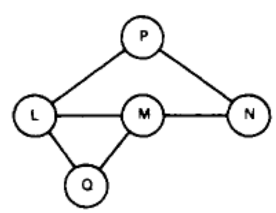
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	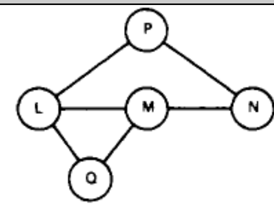 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the

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	end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	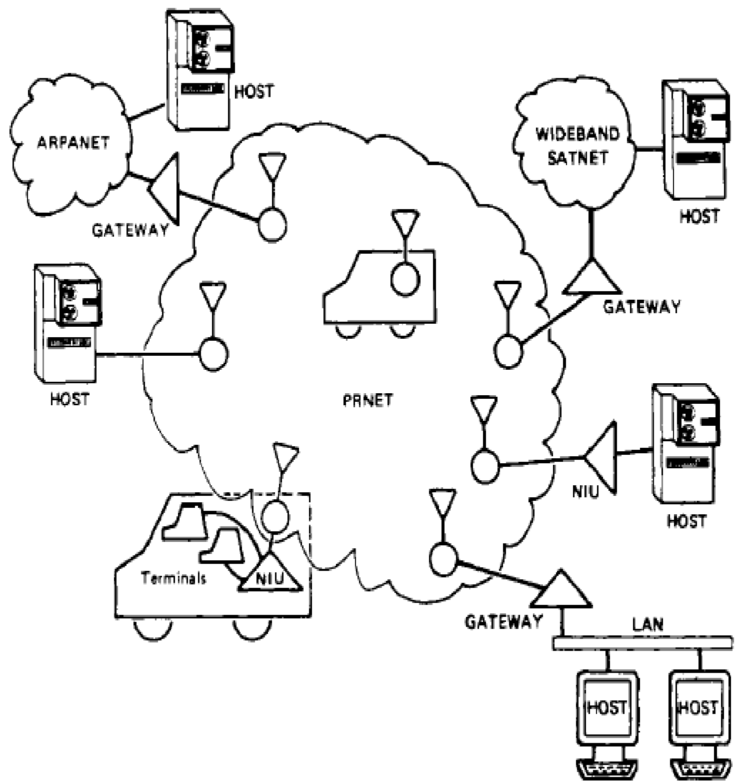 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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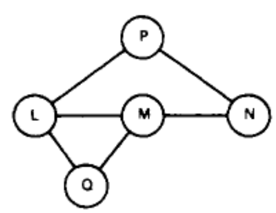
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	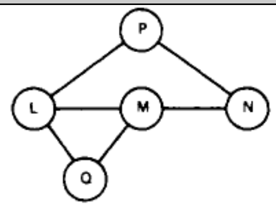 Fig. 2. Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.</td><td>
"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.
"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24.
Fig. 5:
<table>
<tr><th colspan="3">TIER TABLE</th></tr>
<tr><th>Destination PR</th><th>Next-PR In Route</th><th>Tier</th></tr>
<tr><td>N</td><td>N</td><td>0</td></tr>
<tr><td>M</td><td>M</td><td>1</td></tr>
<tr><td>P</td><td>P</td><td>1</td></tr>
<tr><td>L</td><td>M</td><td>2</td></tr>
<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>
Fig. 5. Typical tier table for PR N.
"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.
"Another host computer function called the Network Monitor is used to aid in
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38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "The network information is stored in three tables: • neighbor table • tier table • device table.

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when said comparison meets at least one of several predetermined conditions.	These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "The goal of the tier table is always to maintain the "best" information about how to get to a destination packet radio. The "best" route is currently defined as the shortest route with good connectivity on each hop. Therefore, the tier table is updated only when certain conditions are met. Let us consider that N has received a PROP from M, and examine the conditions for which N updates its tier table, where the update for any given destination PR consists of storing: • as the next PR enroute: M • as the tier: M's reported tier, with respect to the destination PR, incremented by one (referred to as 'T' below). A necessary condition is that M be a bidirectionally good neighbor of N. In addition to the good neighborliness, any one of the following conditions must be met for N to update its tier table: • There is no stored tier data for that destination PR. • The prospective new tier ('T') is strictly less than the M is the same PR that is already stored as the next PR. When the link quality to a neighboring PR (say the link from PR N to PR M) becomes "bad," all routes in N's tier table for which the neighbor PR M is the next PR in the route are also set bad. This means that M can no longer provide a reliable way for N to send packets to a destination PR, and a new next PR should be chosen, and thus a new, good route can be formed even if it is longer than the old, bad one. Just as good tier data are spread via PROPs, the news of bad tier data is also spread via PROPs. PR N will include the news in its PROP that it can no longer provide a route to the destination PRs that it reached via M." Jubin and Tornow at 24.

The '496 Patent – Claims	The Jubin References
	"Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic reconfiguration capability." Jubin and Tornow at 24-25. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

The '496 Patent – Claims	The Jubin References
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on

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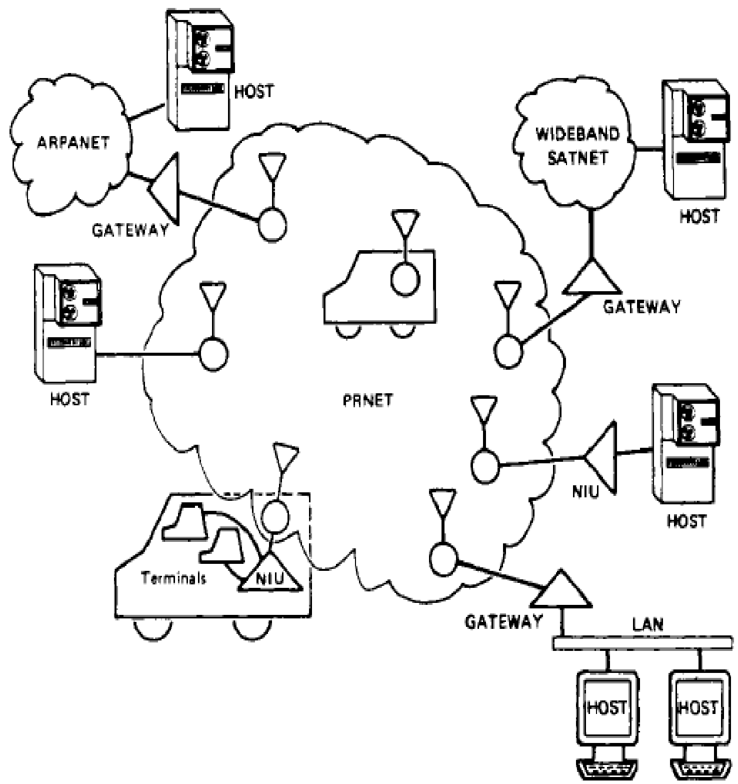
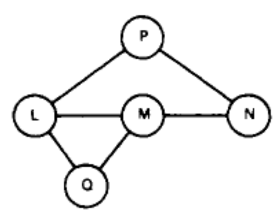
	the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

The '496 Patent – Claims	The Jubin References
	 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

The '496 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes;	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

<table>
<tr><th>The ‘496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td>send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and maintain a client link tree having client link entries representing each of the plurality of client nodes.</td><td>

TIER TABLE

Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

“The goal of the tier table is always to maintain the ‘best’ information about how to get to a destination packet radio. The ‘best’ route is currently defined as the shortest route with good connectivity on each hop.” Jubin and Tornow at 24.

“Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network.” Jubin and Tornow at 23.

“Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic

The '496 Patent – Claims	The Jubin References
	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23.
42. A server for use in a wireless network system including a plurality of clients each including a client	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21.

The '496 Patent – Claims	The Jubin References
controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send

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	data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	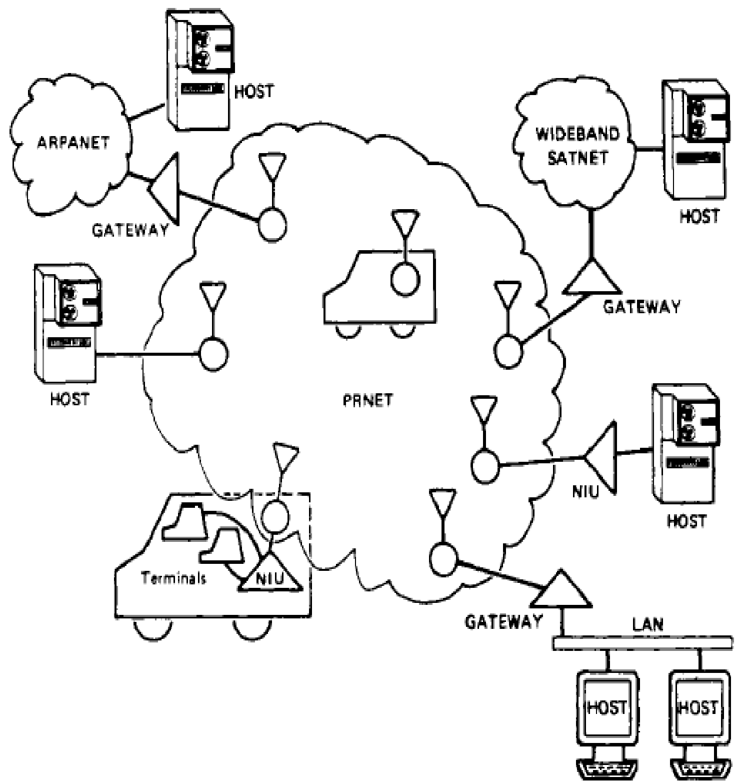 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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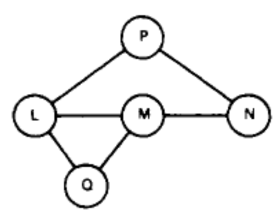
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	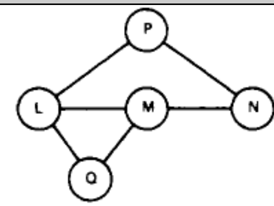 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

The '496 Patent – Claims	The Jubin References
	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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	"[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88.

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said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on

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	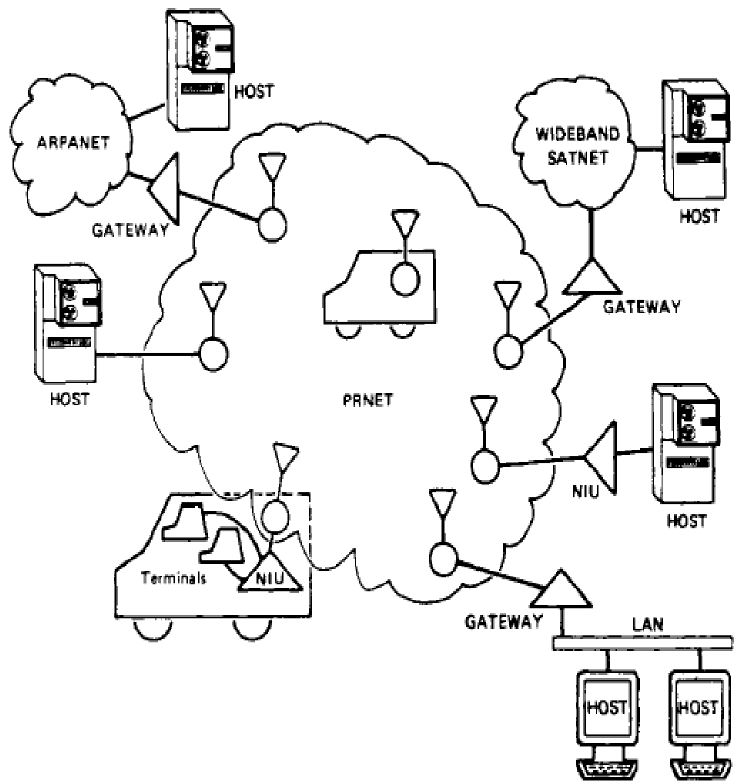 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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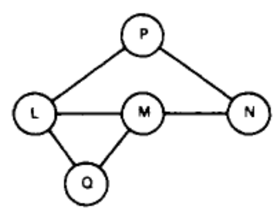
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

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	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

The '496 Patent – Claims	The Jubin References
	TIER TABLE | Destination PR | Next-PR In Route | Tier | |---|---|---| | N | N | 0 | | M | M | 1 | | P | P | 1 | | L | M | 2 | | Q | M | 2 | **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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	TIER TABLE Destination PR / Next-PR In Route / Tier: N / N / 0 M / M / 1 P / P / 1 L / M / 2 Q / M / 2 **Fig. 5.** Typical tier table for PR *N*. "The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24. "Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

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The '496 Patent – Claims	The Jubin References
	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

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<table>
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<tr><td>P</td><td>P</td><td>1</td></tr>
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<tr><td>Q</td><td>M</td><td>2</td></tr>
</table>

Fig. 5. Typical tier table for PR *N*.

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“Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network.” Jubin and Tornow at 23.

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45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF

The '496 Patent – Claims	The Jubin References
	subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

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	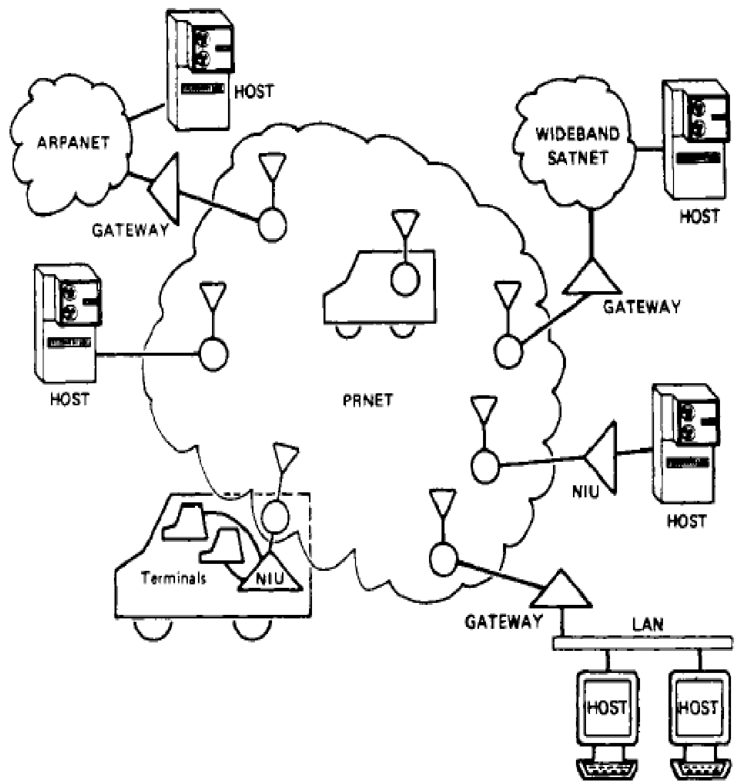 Fig. 4. Packet radio network in the Internet. "The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.

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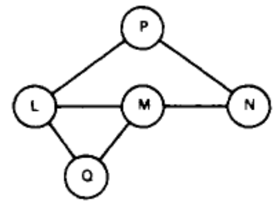
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

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wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:

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	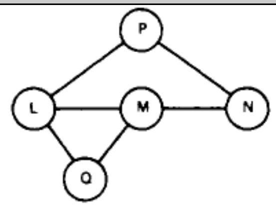 **Fig. 2.** Small packet radio network. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. "The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23.

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	"The network information is stored in three tables: • neighbor table • tier table • device table. These tables are established by the packet radio upon initialization, and are updated automatically by the PRs as the topology changes." Jubin and Tornow at 23. "[W]hen PR L is first powered up, it does not know anything about the network so its PROP simply announces its existence. The PROP is received by all neighboring radios (those in direct connectivity with L). The set of radios that hear the PROP note the event in their neighbor tables. Similarly, PR L will hear the periodic PROPs of its neighboring PRs and will start to build its own neighbor table. Once PR L begins participating in the network by passing data, the data packets are used in addition to the PROPs to maintain the neighbor table." Jubin and Tornow at 24. "This neighbor table, then, represents a PR's accumulated knowledge about all the PRs that are one hop away." Jubin and Tornow at 24. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24.

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said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"In 1973, the Defense Advanced Research Projects Agency (DARPA) initiated research on the feasibility of using packet switched, store-and-forward radio communications to provide reliable computer communications." Jubin and Tornow at 21. "The PRNET provides, via a common radio channel, the exchange of data between computers that are geographically separated. As a communications medium, broadcast radio (as opposed to wires and antenna-directed radio) provides important advantages to the user of the network." Jubin and Tornow at 21. "The PRNET system comprises: • The PRNET subnet, which consists of the packet radios. The PRNET subnet provides the means of interconnecting a community of users[; • The collection of devices (host computers and terminals), each attached to a packet radio via a wire high-level data link control (HDLC) interface, that wish to exchange data in real time." Jubin and Tornow at 22. "[The Low-cost Packet Radio (LPR)] consists of both digital and RF subsystems… The digital subsystem controls the routing and flow of packets between PRs while the RF subsystem transmits and receives packets over the radio channel." Jubin and Tornow at 22. "In order for a user to send data across a PRNET, a device (such as a small host computer) must be connected to a packet radio via an HDLC wire interface. Since the DARPA PRNET is a part of the DARPA Experimental Internet System [7], the devices are responsible for running the DoD-standard internetwork-, transport-, and application-level protocols (IP, TCP, and TELNET). These protocols ensure that the end-to-end communication between hosts is reliable and robust, and allow hosts on

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	the PRNET to communicate with computers on various other packet-switched satellite, terrestrial, radio, and local area networks that also participate in the DARPA Internet. A host computer may be directly interfaced to a PR. If a user wishes to send data across the PRNET from a terminal or host that does not run the required protocols, a Network Interface Unit (NIU) [8], Fig. 3, may be used between the terminal or host and the PR. The NIU performs the necessary host-to-host and terminal specific protocols. The PRNET can also be accessed from other networks via an Internet gateway." Jubin and Tornow at 22-23. Figure 4 (Jubin and Tornow at 23):

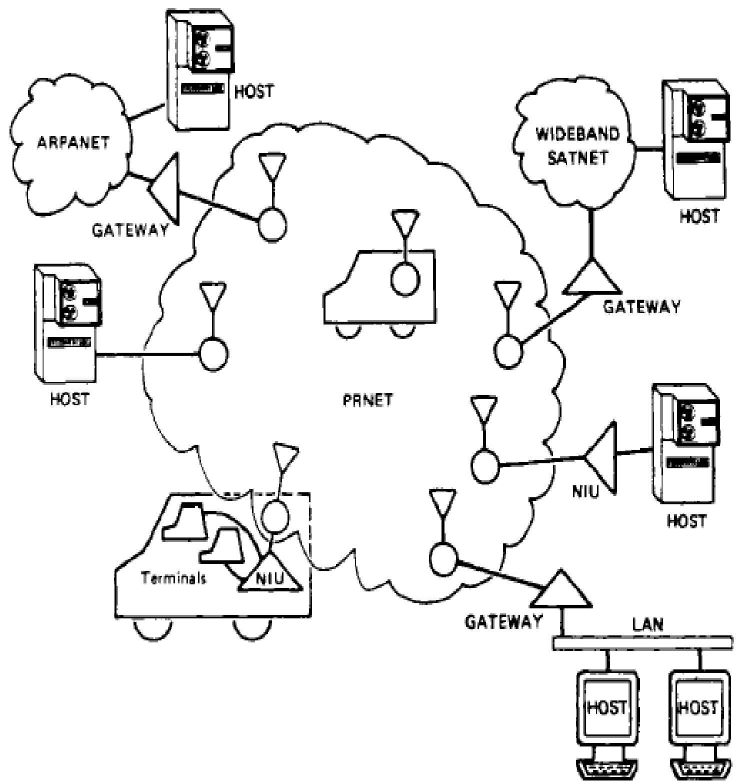
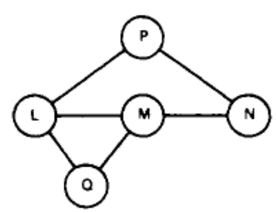
<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
<tr><td></td><td>

Fig. 4. Packet radio network in the Internet.

"The current network protocols are designed to support 138 entities, which can be any combination of PRs and attached devices, in a single network." Jubin and Tornow at 23.</td></tr>
</table>

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	"[A] typical network may be composed of 50 packet radios, many of which have attached devices and some of which serve only as repeaters. Multiple packet radio networks operating on different frequencies may be interconnected via Internet gateways to support applications which require larger networks." Jubin and Tornow at 23. "[A]ll packet radios know of all devices and to which packet radios the devices are attached." Jubin and Tornow at 25. "If a device is moved from one PR to another, or if it goes down, its new status is made known to the network." Jubin and Tornow at 25. "In addition, the PRNET offers generic logical addressing. Generic addressing allows a device to request service from any other device in a general category, e.g., any name server or any gateway." Jubin and Tornow at 25. "In general, a PRNET consists of many PRs that are not all within line-of-sight of each other, and packets must traverse multiple hops to reach their destination." Jubin and Tornow at 22. Fig. 2:  **Fig. 2.** Small packet radio network.

The '496 Patent – Claims	The Jubin References
	"Each PR is responsible for receiving a packet and relaying it on to a PR that is one hop closer to the final destination. The packets can be routed either to another PR over the radio channel or to an attached device (i.e., host computer or terminal) via the wire interface." Jubin and Tornow at 22. "As a general rule, packets are handled first-in first-out (FIFO). However, there are two exceptions to the FIFO rule. The first exception is a result of the pacing protocol described in the preceding section. Pacing can slow the rate of forwarding to one neighbor PR compared to the rate to another neighbor PR. Therefore, a packet j headed in a "fast" direction and therefore ready to go, in the pacing sense, is transmitted before one i headed in a "slow" direction and therefore not ready to go, even if i arrived before j. There is, however, a single radio transmit queue, so that, when several packets are ready to go at the same time, they will be transmitted FIFO, that is, i before j. The second exception to the FIFO rule is that received packets are not always entered at the tail of the radio transmit queue. The purpose of this exception is to overcome the inherent unfairness that may exist among various receive links. Consider in Fig. 8 three streams of packets merging at one PR (X), all going to the same neighbor PR (V): one stream is coming over a weak radio link from PR A, another is coming over a strong radio link PR B, and the last is coming over the practically error-free wire interface from device C. With straight FIFO queuing, the wire interface stream would monopolize PR X's buffer and transmission resources, and the weak radio link would not get its share. Furthermore, the pacing protocol would provide positive feedback to further exacerbate the situation." Jubin and Tornow at 28. "Packet radio networking technology applies the packet switching class of

The '496 Patent – Claims	The Jubin References
	communication to the broadcast radio channel in multi-hop networks." Jubin 1985 at 86. "Transmit link ratings are used to decide on which data rate to transmit traffic packets. Transmit and receive link ratings are used to give an overall bi-directional rating to a link; both link directions must be good to declare a link to be bi-directionally good." Jubin 1985 at 88. "A packet radio network, then, consists of two or more [packet radios], each one of which is within range of at least one other [packet radio], but all of which are not necessarily within range of each other. User devices … which wish to communicate with each other attach to [packet radios] via a wire interface." Jubin 1985 at 86. "Each [packet radio] transmits a control packet…" Jubin 1985 at 88. "[Packet radios] recognize the existence of new links, i.e., [packet radio]-to-[packet radio] transmission reception paths, by observing the transmitting [packet radio identification] in all received packets. They judge the quality of each link in terms of the ratio of the number of packets which the receiving [packet radio] received correctly … from the transmitting [packet radio] during a time period to the number of packets which the transmitting [packet radio] actually transmitted during the same time period." Jubin 1985 at 88. "The pacing protocol provides flow and congestion control." Jubin 1985 at 90. "Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet radio] creates and maintains:

Exhibit B2 – Invalidity Chart for Brownrigg Family based on the Jubin References

The '496 Patent – Claims	The Jubin References
	- a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "The routing tables are maintained as follows. Every PR periodically transmits in a control packet (the packet which contains the neighbor data) its list of distant PR IDs, each with the route length to it and with its list of attached device IDs. Upon receipt of such a control packet…a PR extracts each distant PR ID with the route length and considers updating the corresponding entry in its distant PR table." Jubin 1985 at 88. "If a PR…which has forwarded a packet does not receive an acknowledgement within a certain interval…it…retransmits the packet." Jubin 1985 at 90.
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"The PRNET features fully distributed network management. Each packet radio gathers and maintains enough information about network topology so that it can make independent decisions about how to route data through the network to any destination." Jubin and Tornow at 23. "[U]ltimately every radio knows its distance in tiers from any prospective destination [packet radio] and which [packet radio] is the next [packet radio] enroute to that destination [packet radio]." Jubin and Tornow at 24. Fig. 5:

<table>
<tr><th>The '496 Patent – Claims</th><th>The Jubin References</th></tr>
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TIER TABLE		
Destination PR	Next-PR In Route	Tier
N	N	0
M	M	1
P	P	1
L	M	2
Q	M	2

Fig. 5. Typical tier table for PR *N*.

"The goal of the tier table is always to maintain the 'best' information about how to get to a destination packet radio. The 'best' route is currently defined as the shortest route with good connectivity on each hop." Jubin and Tornow at 24.

"Another host computer function called the Network Monitor is used to aid in observing and analyzing the PRNET. Each PR continuously gathers measurements on bidirectional link quality, nodal capacity, and route characteristics. The Network Monitor will collect data from each of the packet radios and display them graphically to aid the network designers in characterizing and understanding the network behavior. The Network Monitor is currently defined as an optional component of the network because it does not contribute in any way to the management of the network." Jubin and Tornow at 23.

"Routes from each [packet radio] to all other [packet radios] in the network and their attached devices are created and maintained in a distributed manner. Each [packet

</td></tr>
</table>

The '496 Patent – Claims	The Jubin References
	radio] creates and maintains: - a table of the device IDs attached to it; - a table of all distant device IDs, each with the ID of the (distant) PR to which it is attached; - a table of distant [packet radio] IDs each with the ID of the next [packet radio] in the route to it, the length of the route, i.e., the number of links to be traversed to reach it." Jubin 1985 at 88. "Routing in the PRNET is done by having each PR maintain knowledge of the best PR to forward packets to every prospective destination. This is similar to the early ARPANET routing algorithm [11]. Each PR that receives PR L's PROP notes that it is only one radio hop away, so it is at 'tier 1' with respect to PR L, and includes this information about the network topology in its next PROP. Still other PRs hear the PROPs broadcast by the PRs which are at tier 1 with respect to L, note that they are one hop away from the PRs from which the PROP was received, and therefore at tier 2 with respect to PR L (which emitted the original PROP). These second-tier PRs, in turn, relay this information out another tier in the PROPs, and so on." Jubin and Tornow at 24. "After a PR (say PR l in Fig. 2) has been powered on, and has loaded its protocol software into RAM, it begins the process of establishing and maintaining local connectivity. As long as the PR is powered up, it will broadcast a Packet Radio Organization Packet (PROP) every 7.5 s, announcing its existence and information about the network topology from its perspective." Jubin and Tornow at 24. "Information gathered from the headers of data packets is also used to update the tier tables. Under heavy traffic loads, this greatly improves the network's responsiveness to a rapidly changing topology, and contributes significantly to the PRNET's automatic

The '496 Patent – Claims	The Jubin References
	reconfiguration capability." Jubin and Tornow at 24-25. "We have described the algorithms and illustrated how the PR NET system (i.e., the LPRs along with their attached devices) provides highly reliable network transport and datagram service, by dynamically determining optimal routes, effectively controlling congestion, and fairly allocating the channel in the face of changing link conditions, mobility, and varying traffic loads." Jubin and Tornow at 32.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The Network Analysis references include descriptions relating to hierarchical routing in a packet radio network. The references include:

1. Network Analysis Corp., "The Practical Impact of Recent Computer Advances on the Analysis and Design of Large Scale Networks: Second Semiannual Technical Report," National Tech. Inf. Serv. AD-777 738 (Dec. 1973) (NAC Dec. 1973).
2. Network Analysis Corp., "The Practical Impact of Recent Computer Advances on the Analysis and Design of Large Scale Networks: Third Semiannual Technical Report," National Tech. Inf. Serv. AD-A016 577 (Jun. 1974) (NAC June 1974).
3. Network Analysis Corp., "The Practical Impact of Recent Computer Advances on the Analysis and Design of Large Scale Networks: Fourth Semiannual Technical Report," National Tech. Inf. Serv. AD-A016 578 (Dec. 1974) (NAC Dec. 1974).
4. Gitman et al., "Routing in Packet-Switching Broadcast Radio Networks," IEEE Trans. on Comm. at 926 (Aug. 1976) (Gitman).
5. Hahn, "Packet Radio Network Routing Algorithms: A Survey," 22 IEEE Comm. 41 (Nov. 1984) (Hahn).

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Network Analysis References
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising:	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

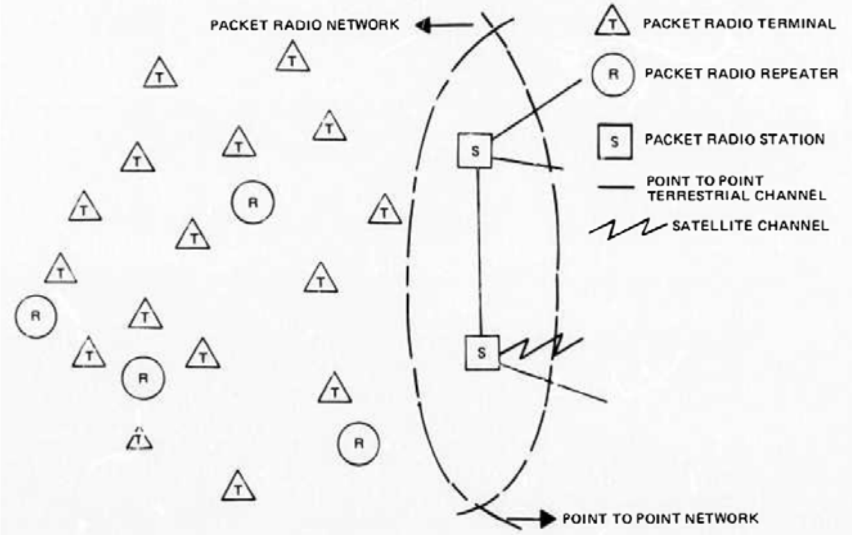
The '516 Patent – Claims	Network Analysis References
	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '516 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication;	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec.

The '516 Patent – Claims	Network Analysis References
	1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
a network interface capable of communicating with a second network; and	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region.

The '516 Patent – Claims	Network Analysis References
	b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
a digital controller coupled to said	"In some applications the Packet Radio Station will be the interface component

The '516 Patent – Claims	Network Analysis References
radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface,	between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global

The '516 Patent – Claims	Network Analysis References
	initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '516 Patent – Claims	Network Analysis References
	See also NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it

The '516 Patent – Claims	Network Analysis References
	does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each

The '516 Patent – Claims	Network Analysis References
	path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973

The '516 Patent – Claims	Network Analysis References
transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II

The '516 Patent – Claims	Network Analysis References
	Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '516 Patent – Claims	Network Analysis References
	sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	The NAC references provide stations with gateway functions to a point-to-point network, such as ARPANET, which would inherently involve the TCP/IP protocol (at least as of 1982). At a minimum, it would have been obvious to use TCP/IP in the point-to-point protocol in order to provide a well-known and reliable protocol.
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be

The '516 Patent – Claims	Network Analysis References
	transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol	"type of data associated with the packet" "Once all the repeaters have been labeled, each data packet sent by the central site

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

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network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and	can contain the label of the repeater to which the station has been assigned. The packet must also contain a pointer indicating the current field in the label. When a packet arrives at a repeater, the packet label's current field and the repeater label's corresponding field are checked for a match. II they match, then the repeater either decrements or increments the current field indicator, depending on whether the packet is being directed to or from the station, and forwards the packet." Hahn at 44.
wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1.

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	See also NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
10. A method providing a gateway between a wireless network and a second network comprising:	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region.

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	b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
receiving a data packet from a client	"In some applications the Packet Radio Station will be the interface component

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of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and	between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global

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	initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	"data packet type" "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1.

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	See also NAC Dec. 1973 at §§ 9-10; *id*. at pp. 10.25-10.26 (packet format). *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "Once all the repeaters have been labeled, each data packet sent by the central site can contain the label of the repeater to which the station has been assigned. The packet must also contain a pointer indicating the current field in the label. When a packet arrives at a repeater, the packet label's current field and the repeater label's corresponding field are checked for a match. If they match, then the repeater either decrements or increments the current field indicator, depending on whether the packet is being directed to or from the station, and forwards the packet." Hahn at 44.
changing transmission paths of clients to optimize the transmission paths including changing the transmission	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to

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path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID.

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	STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater.

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	Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	The NAC references provide stations with gateway functions to a point-to-point network, such as ARPANET, which would inherently involve the TCP/IP protocol (at least as of 1982). At a minimum, it would have been obvious to use TCP/IP in the point-to-point protocol in order to provide a well-known and reliable protocol.
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33.

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the server can be through one or more other clients of the first network.	"The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables

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	every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown

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	in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70.

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	"The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928.

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	"Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

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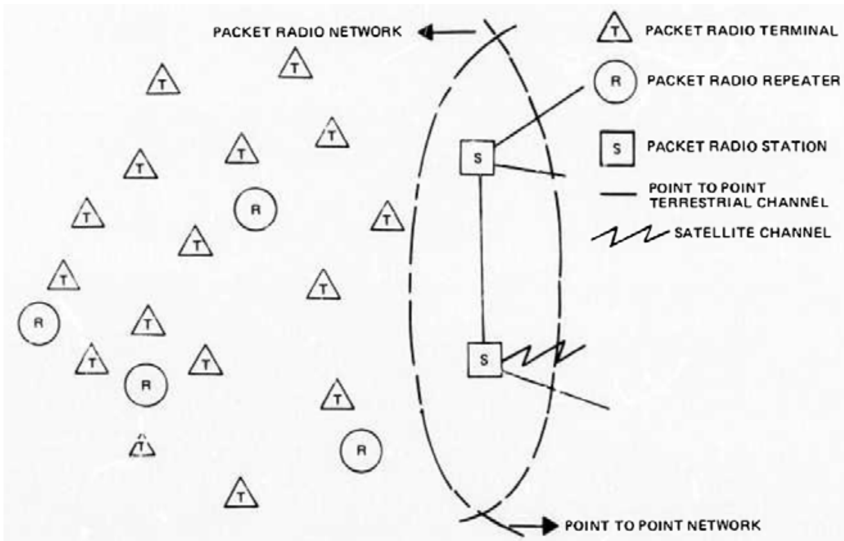
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and

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	routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum.

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	b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types

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	of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL

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	indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a

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upgrade the selected transmission path in response to a request from at least one of said second nodes.	hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it

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	determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater.

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	Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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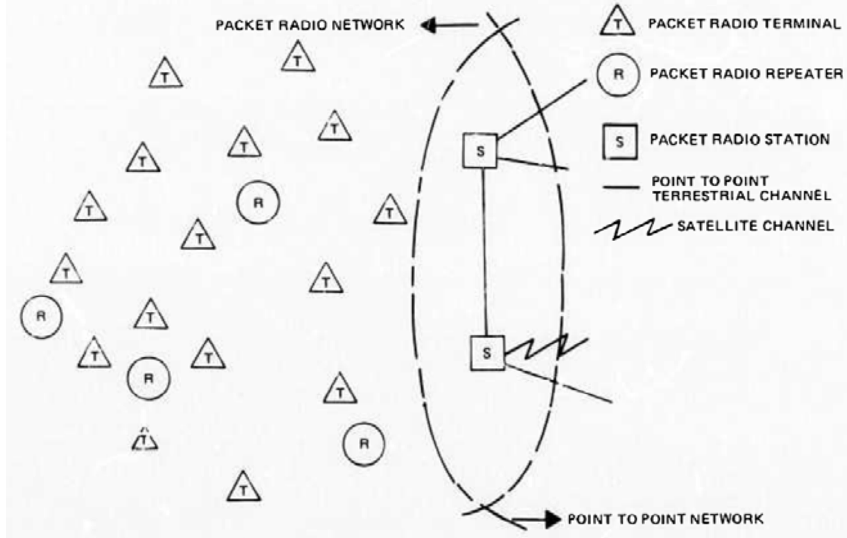
second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

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	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of

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	labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. …

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	Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the

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10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	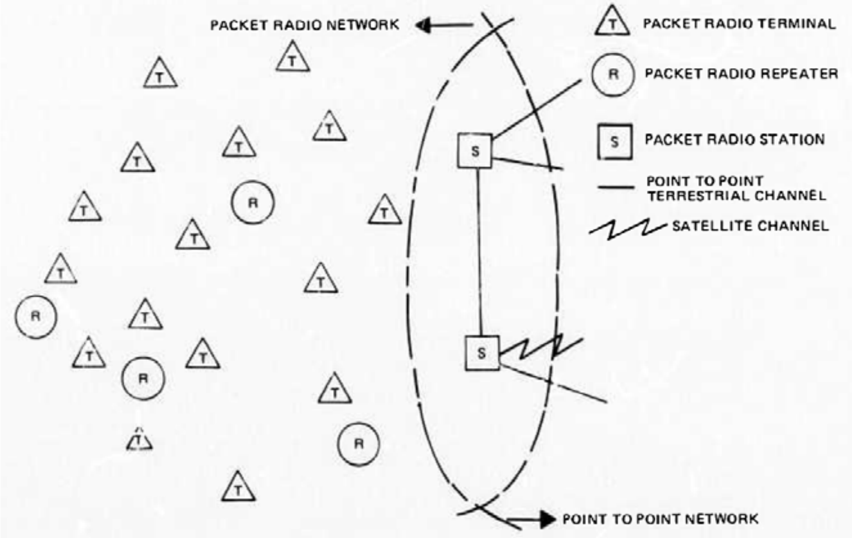 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

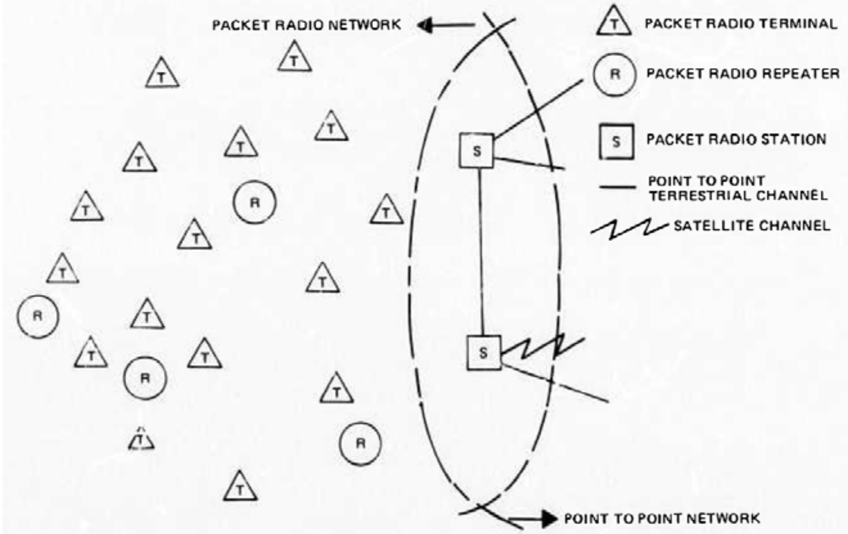
<table>
<tr><th>The '314 Patent – Claims</th><th>Network Analysis References</th></tr>
<tr><td>said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,</td><td>

Figure 10.1: Packet Radio System

"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1.

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said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

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wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above

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	927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the

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	failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

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	See also NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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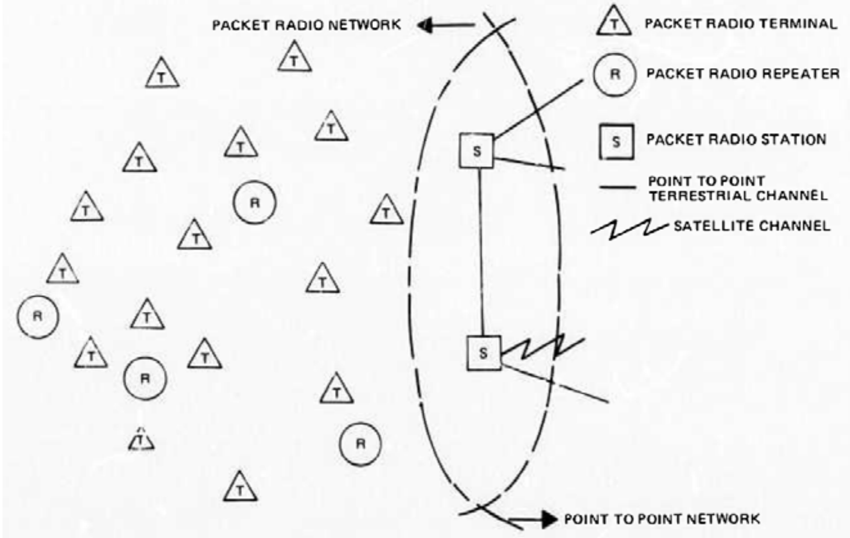
<table>
<tr><th>The '314 Patent – Claims</th><th>Network Analysis References</th></tr>
<tr><td>first transmitter implementing a process to transmit said data packet to a proper location on said second network; and
a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and</td><td>

Figure 10.1: Packet Radio System

"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1.

See also NAC Dec. 1973 at §§ 9-10.

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

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	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of

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	labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

Invalidity Chart for U.S. Patent No. 8,233,471

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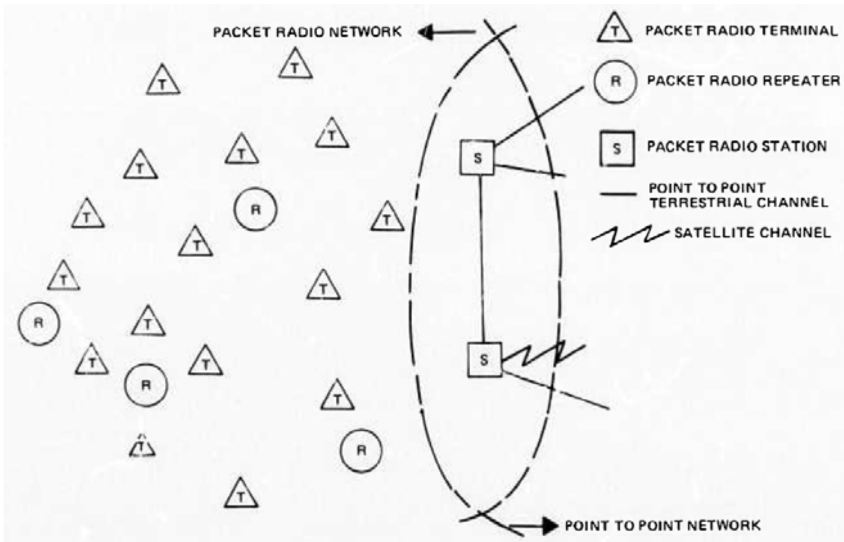
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and

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	routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. …

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	Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up

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	its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of

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	the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages

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	reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the

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	flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930.

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4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary

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	skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	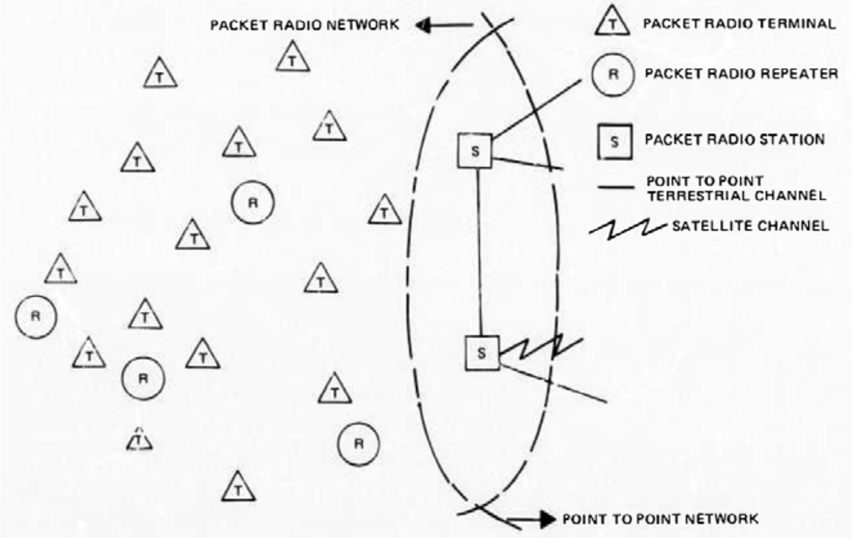 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33.

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based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables

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	every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number

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	of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing

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	information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an

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	alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting

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	unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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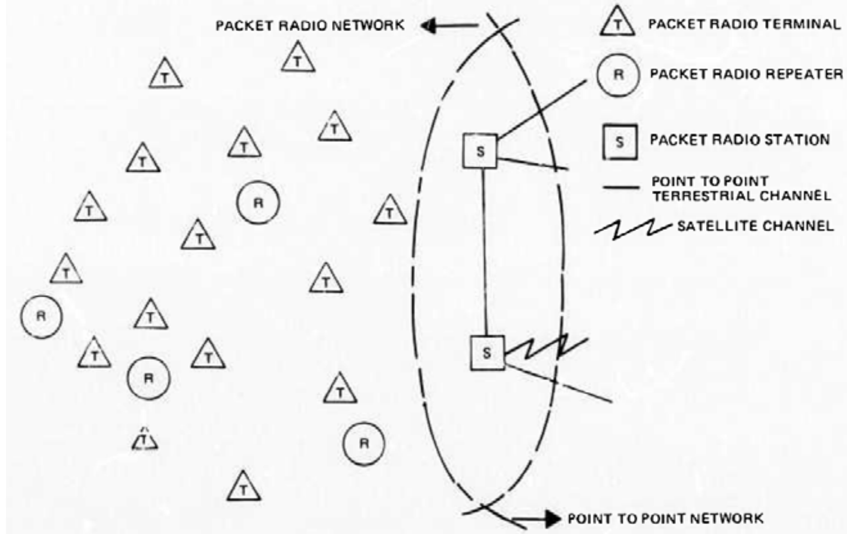
providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater

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	exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."

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12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	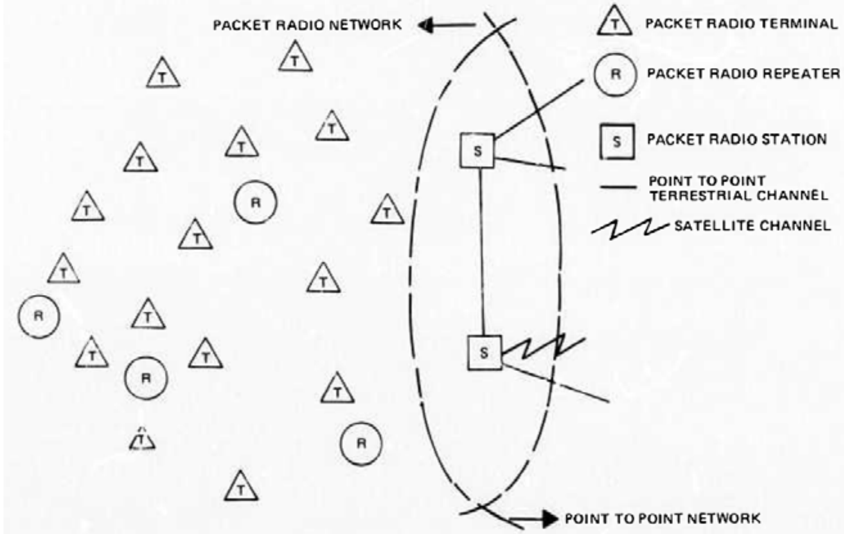 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33.

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plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables

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	every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number

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	of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing

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	information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an

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	alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting

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	unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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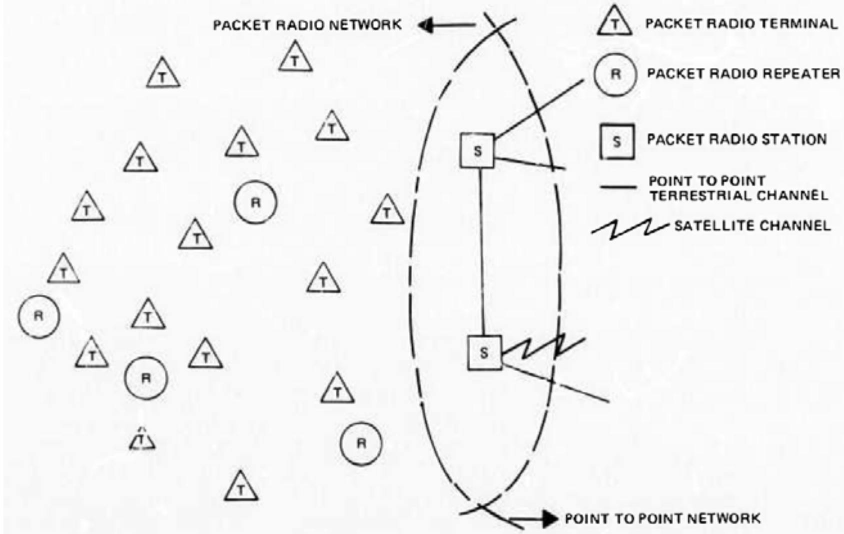
process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '471 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater

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	exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."

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19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	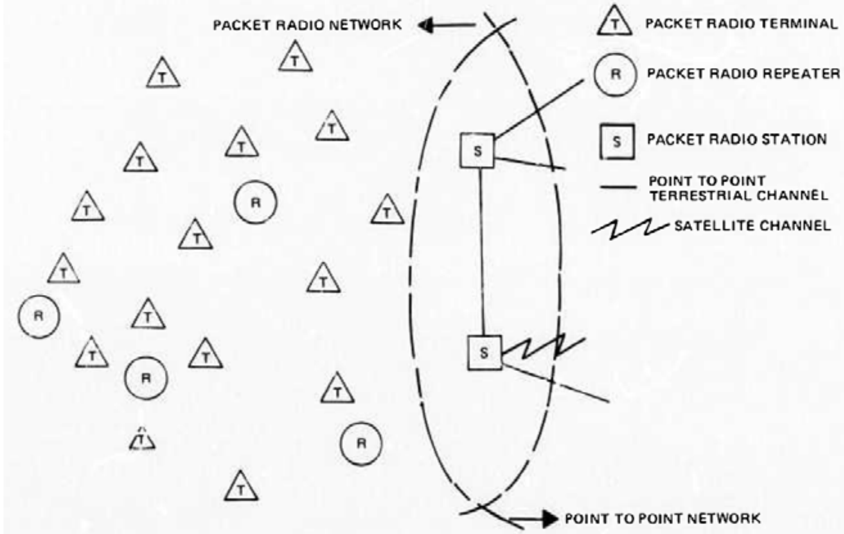 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

The '471 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

The '471 Patent – Claims	Network Analysis References
	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would

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nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

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	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4.

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node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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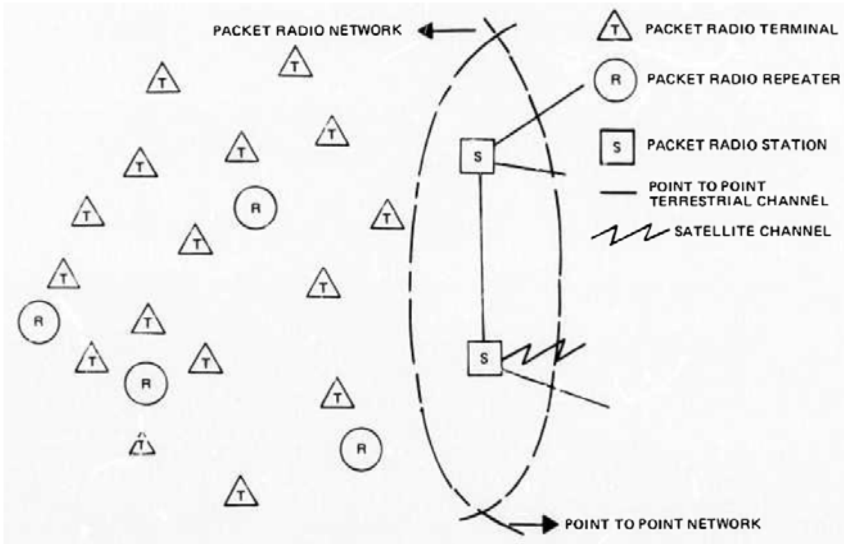
radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal.

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	Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a

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	station." Hahn at 42.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the

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	responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
the first node process further comprises maintaining a second node link tree having second node link entries.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for

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	repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an

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one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

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	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees

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said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers,

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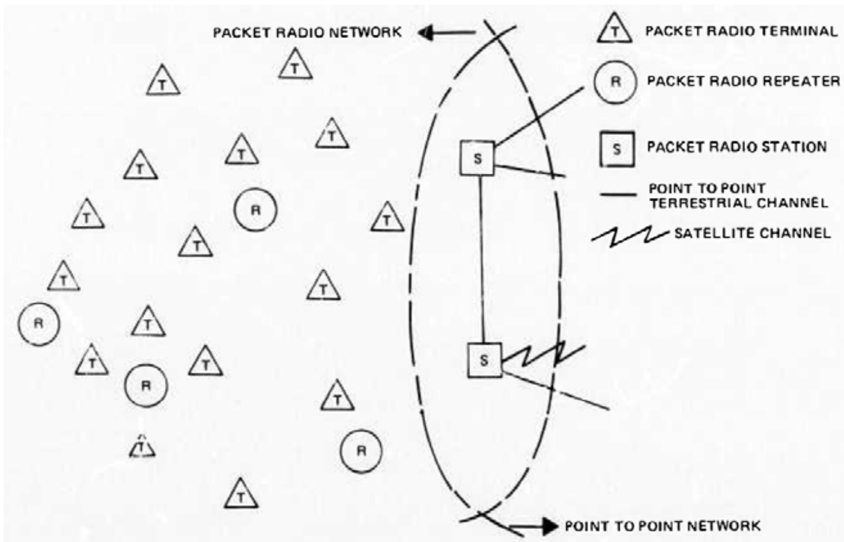
data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of

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	creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal.

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	Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional

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	processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters

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	sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
maintaining a second node link tree having second node link entries at the first node.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it

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	does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each

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	path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
35. A method as recited in claim 34, wherein said first node process further includes:	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For

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comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in

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	network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT.

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second nodes in said second node tree if said second node is authentic.	1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital

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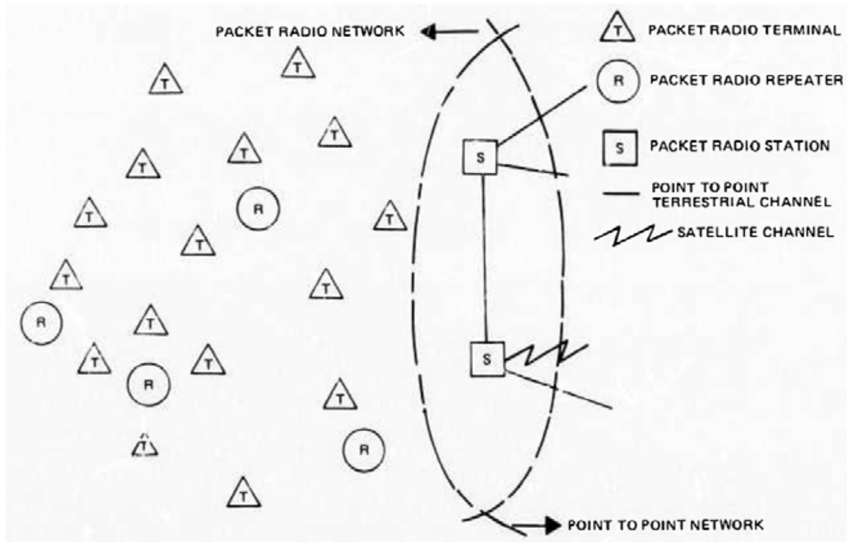
implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process,	terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio

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	network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient

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	next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination,

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	destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
said server process configured to: receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70.

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	"The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928.

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	"Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus

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	reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.

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41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random

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	transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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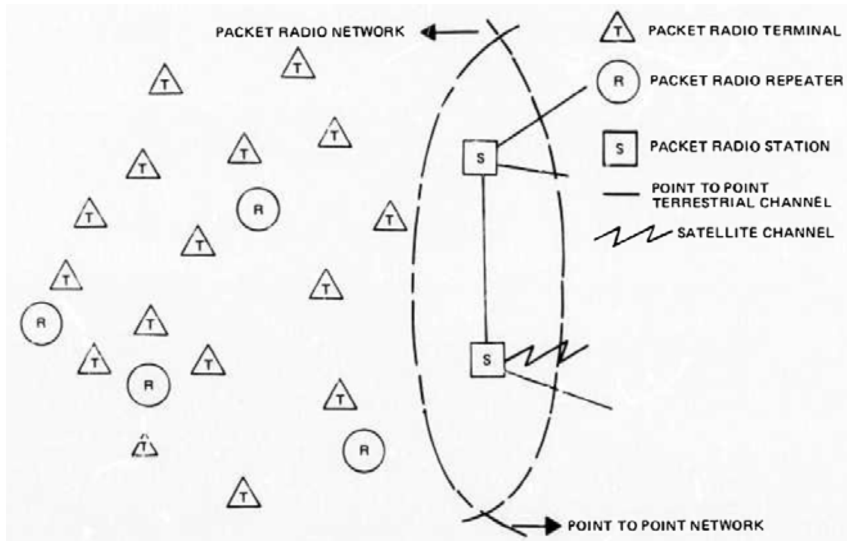
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and

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	routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum.

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	b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types

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	of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL

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	indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a

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plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and	hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it

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	determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater.

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	Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6.

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	"In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
maintain a client link tree having	"The station will determine and assign labels to all repeaters in its area in the initial

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client link entries representing each of the plurality of clients.	labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into

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	which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to

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	another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	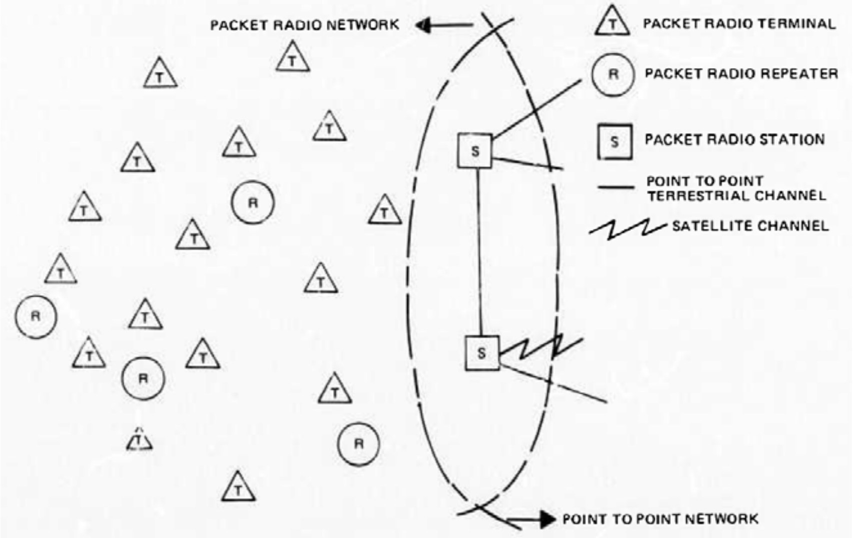 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33.

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selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus

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	reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.

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3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25.

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determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to

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	avoid use of the illegitimate client.
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	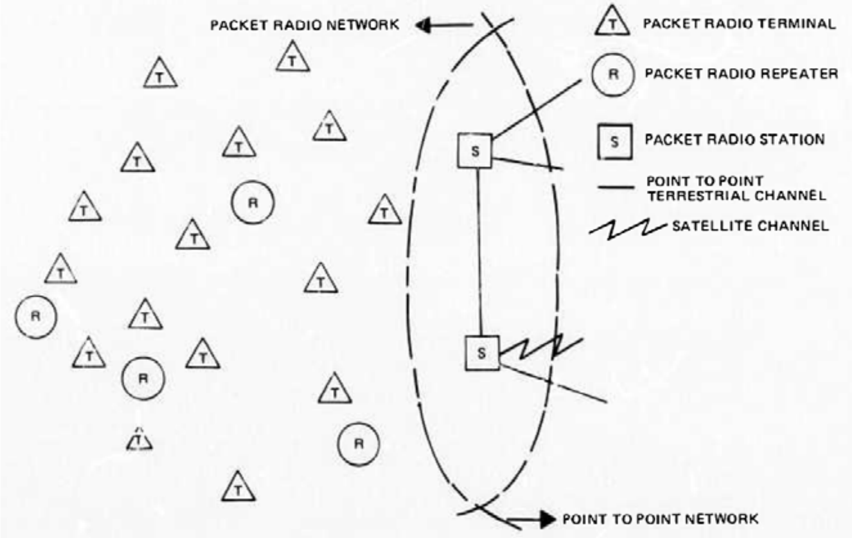 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33.

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selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables

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	every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus

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	reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.

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8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned

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	answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25.

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determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to

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	avoid use of the illegitimate client.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an

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	acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	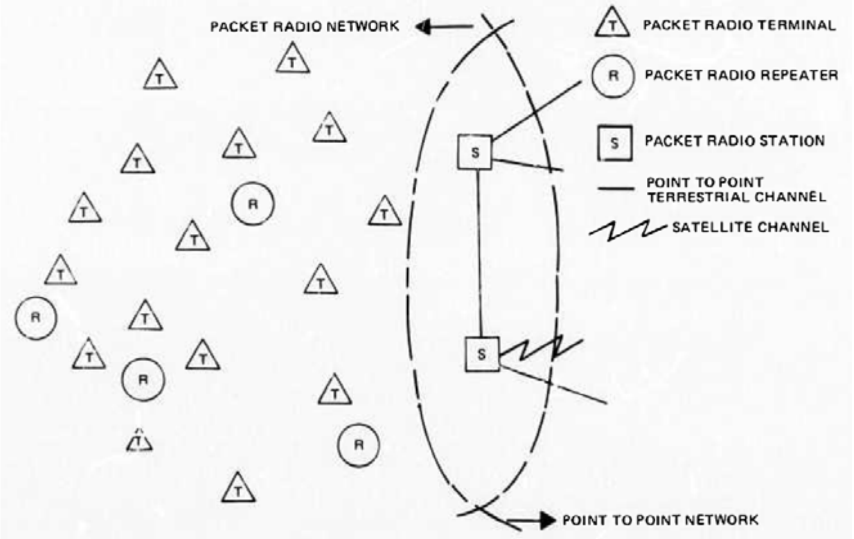 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an

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	acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can

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	accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and

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	determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should

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	be temporarily disabled ... STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

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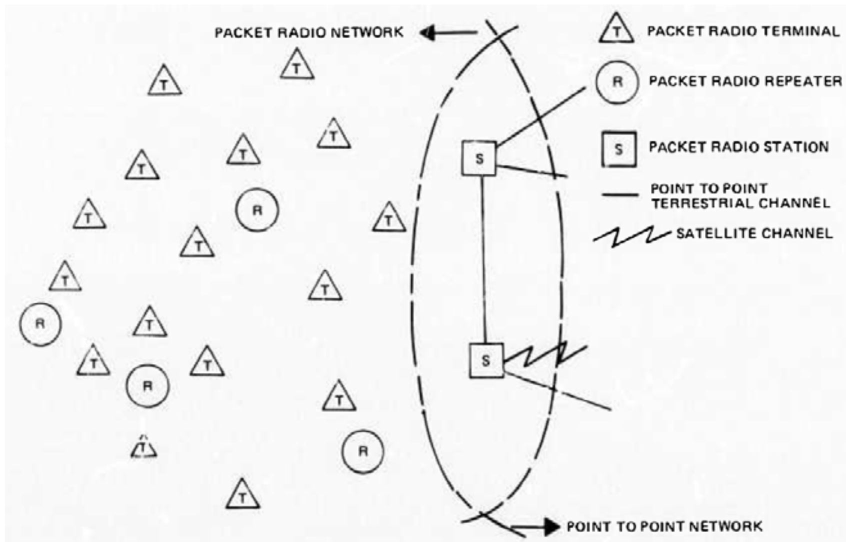
12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and

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	routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum.

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	b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL

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	indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a

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	hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it

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	determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in

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	network topology occur." Hahn at 43.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an

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	acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above

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	repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at

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	927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the

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	failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928.

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	"This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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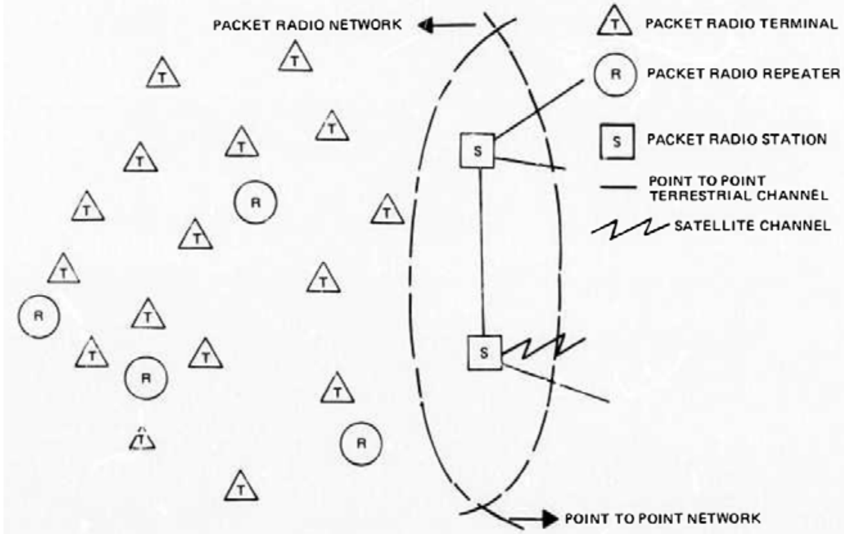
sending and receiving step, a send and receive data buffer maintenance step, and	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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maintains a client link tree having client link entries representing each of the plurality of clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and

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	determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should

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	be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

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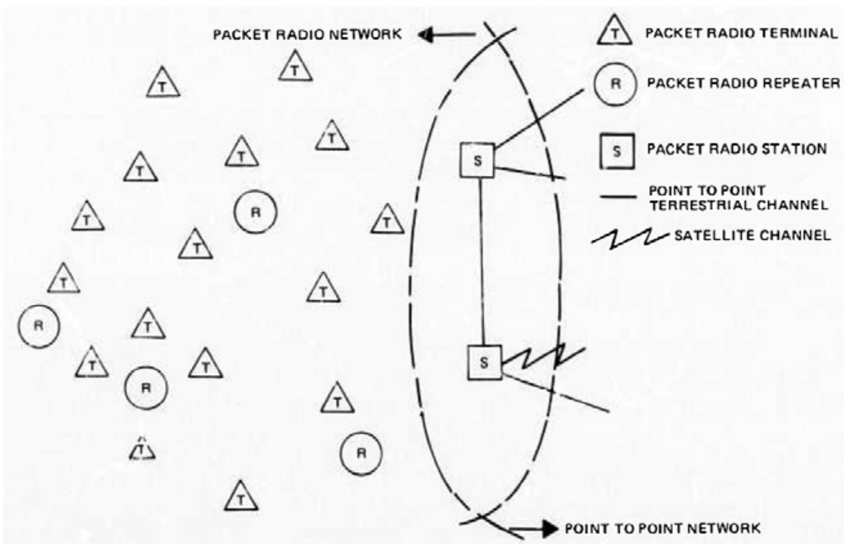
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and

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wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a

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	network topology occur." Hahn at 43.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an

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	acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

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19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above

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	repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at

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	927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the

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	failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928.

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	"This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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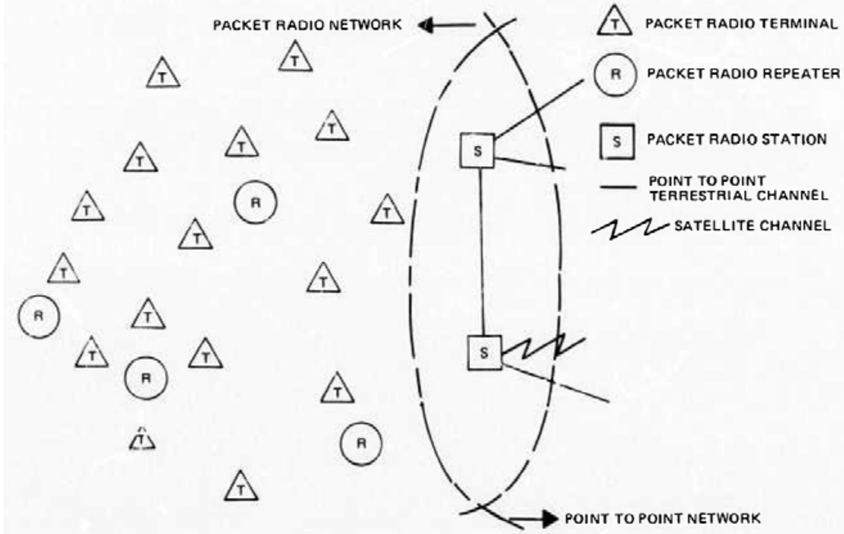
node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

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	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

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23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	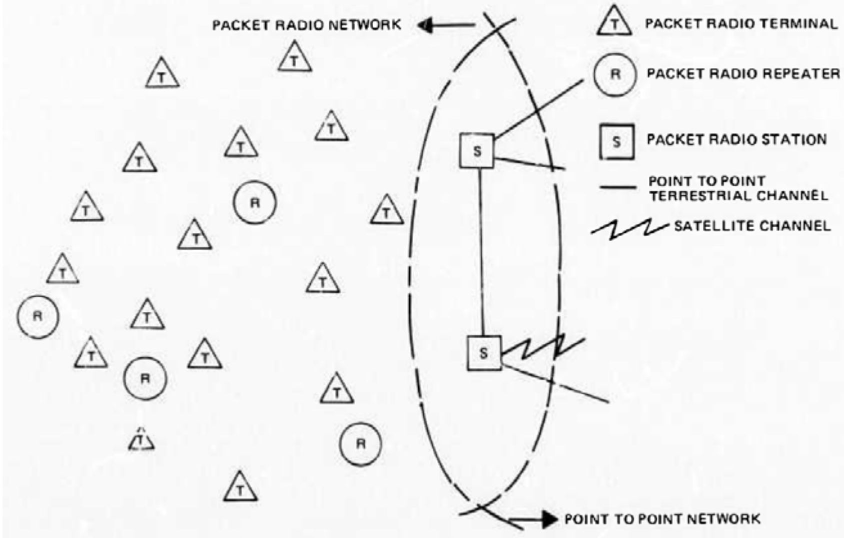 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	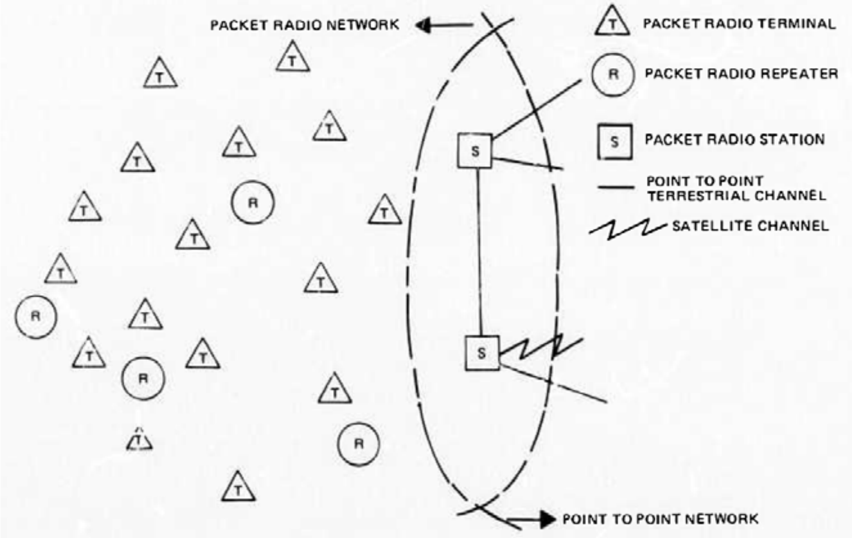 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '496 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

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	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central

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	site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above

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	repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at

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25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes.

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dynamically updating said second node link tree when said comparison meets predetermined conditions.	Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For

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	example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling

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27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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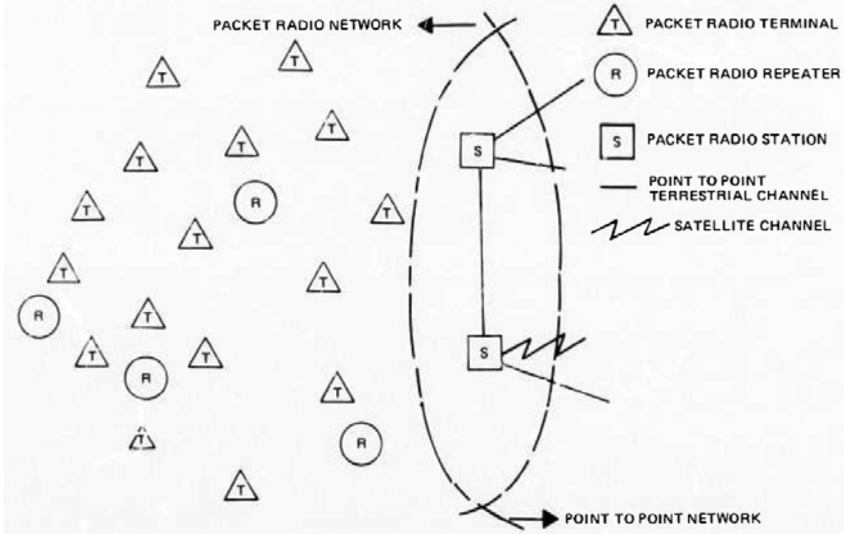
radio, communicating with a network, performing node link tree housekeeping functions,	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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maintaining a second node link tree having second node link entries representing each of the plurality of second nodes, dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes,	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

The '496 Patent – Claims	Network Analysis References
	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central

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	site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
a second node in the plurality of second nodes, the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	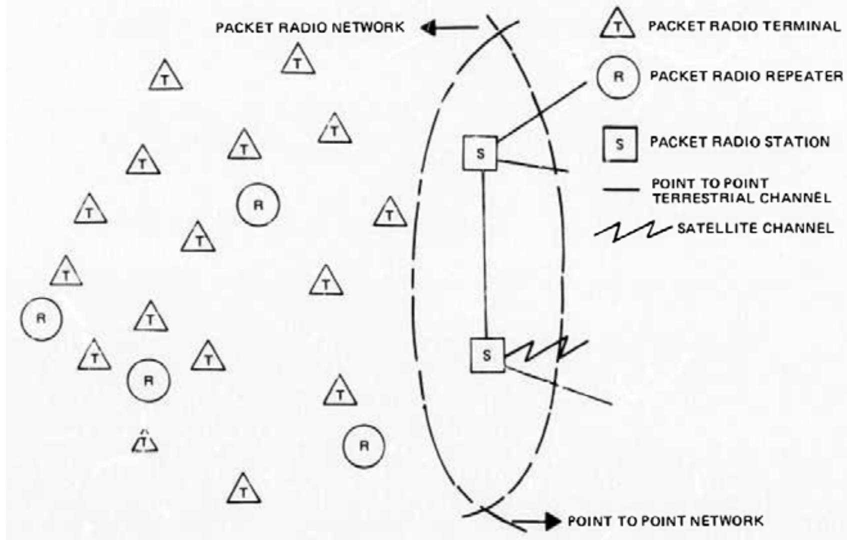 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	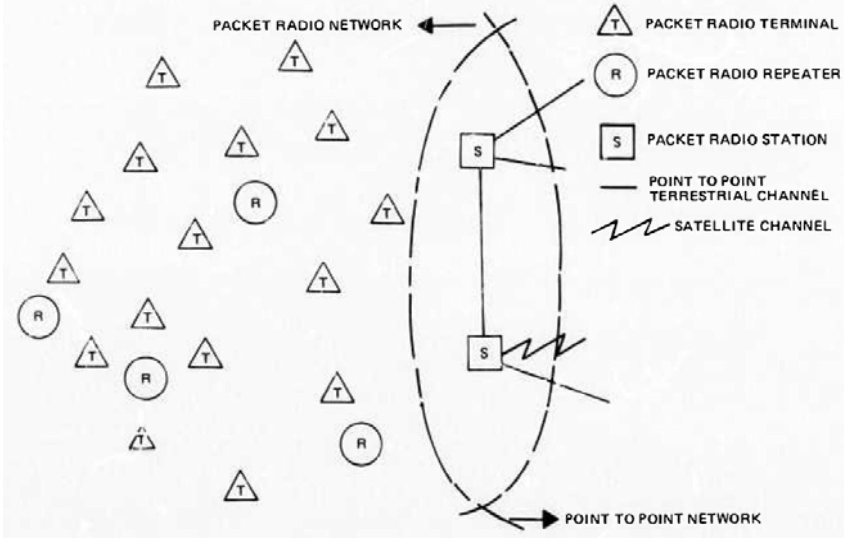 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	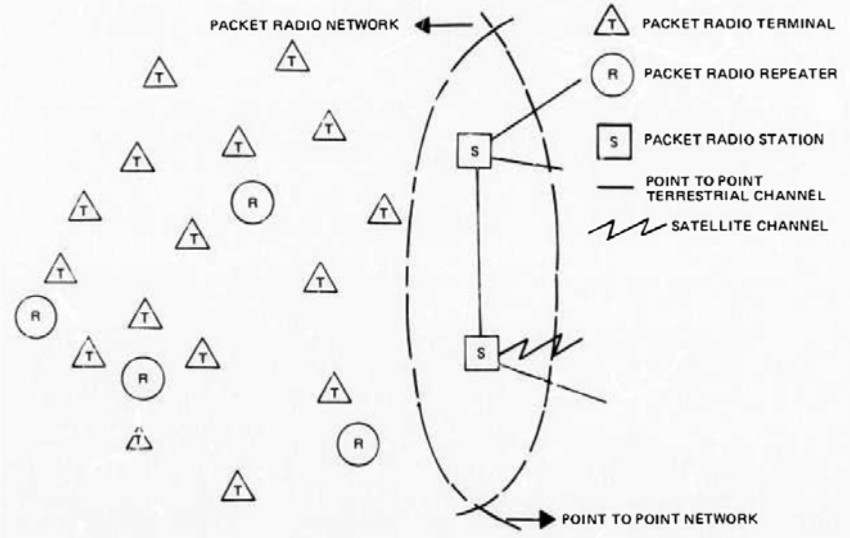 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928.

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	"Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations

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	already in its cache."
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175.

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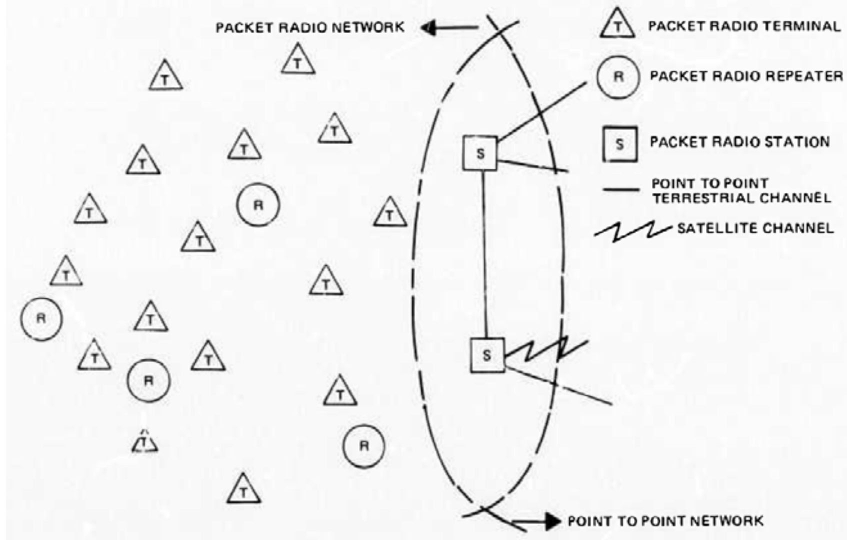
	To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

The '496 Patent – Claims	Network Analysis References
	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

The '496 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '496 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

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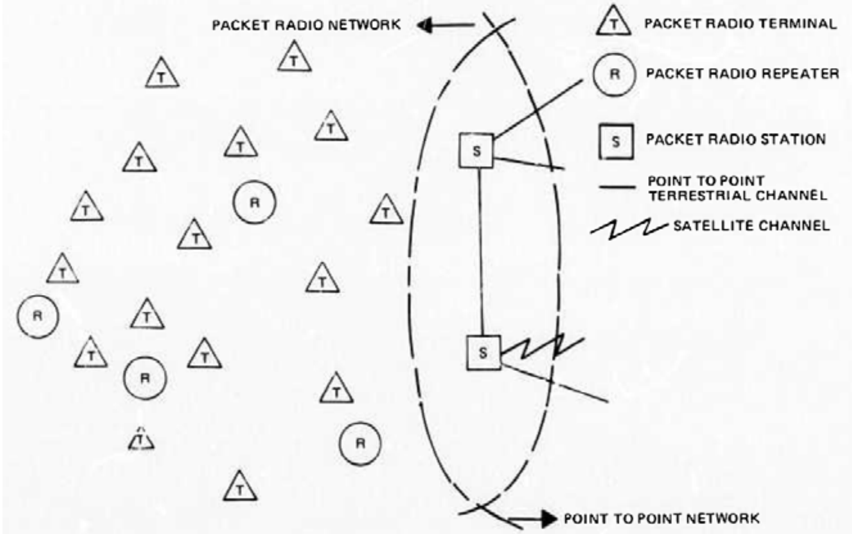
	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central

The '496 Patent – Claims	Network Analysis References
	site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

The '496 Patent – Claims	Network Analysis References
	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

The '496 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '496 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '496 Patent – Claims	Network Analysis References
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

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	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	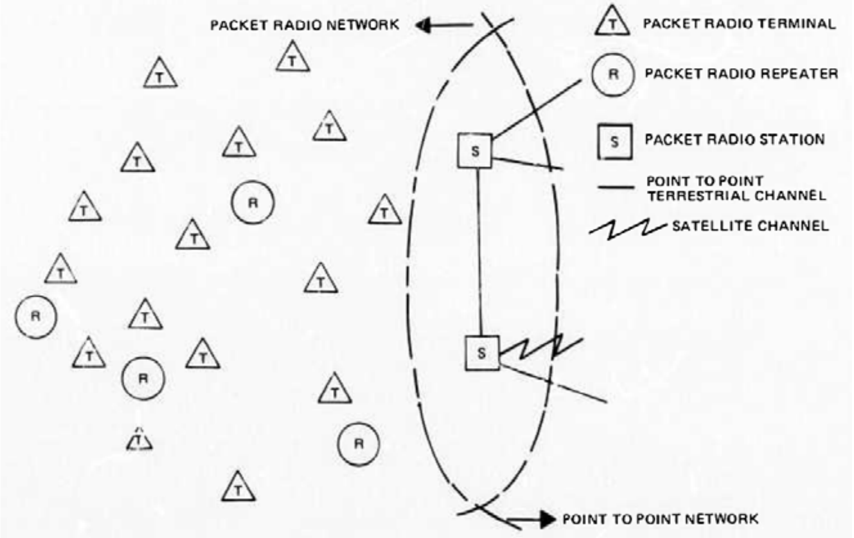 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

The '496 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '496 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding

The '496 Patent – Claims	Network Analysis References
	repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under

The '496 Patent – Claims	Network Analysis References
	implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8.

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	"The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would

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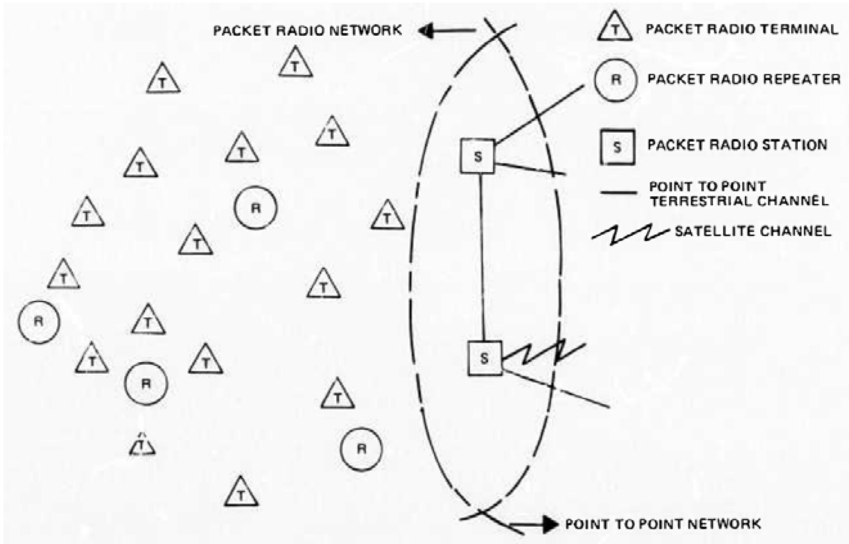
said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	allow the station to react to network changes and faster updates of labels. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.

The '496 Patent – Claims	Network Analysis References
	To the extent not disclosed or inherent in the Network Analysis Corp. references, it would have been obvious to a person of ordinary skill in the art to compare the label used by the packet headers of the repeaters to the label expected by the station. For example, when a path is blocked, the repeaters search for a new label or use an alternate label. Allowing the station to compare the label and update the tree would allow the station to react to network changes and faster updates of labels. Such use of a route cache is suggested by David B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proceedings of the IEEE Workshop on Mobile Computing Systems and Applications (Dec. 1994) ("Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examin[in]g the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache."
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree	The '062 patent admits that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The '062 patent also admits that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4.

The '496 Patent – Claims	Network Analysis References
if said second node is authentic and is not already in said client link tree.	Flanders is directed towards protecting subscribers in wireless telecommunications systems. Specifically, Flanders teaches authenticating clients before enabling communications with said clients. In addition, Flanders teaches restricting unauthenticated users from participating in wireless communications within a wireless communications network. See, e.g., Flanders at 4:8-12, 4:32-36. column 14:51-52; 15:18-19. Wey is directed towards authentication m mobile communications systems. Specifically, Wey discloses authenticating the identity of a subscribing unit (i.e., client), enabling communications if the identity is authenticated, and denying communications if the identity is unauthenticated. See, e.g., Wey at 175. To the extent not disclosed or inherent in the Network Analysis Corp., such features would have been obvious to a person of ordinary skill in the art. A person of ordinary skill in the art would have found it obvious to authenticate clients wishing to join a network. Authentication would have several benefits, including reduction in traffic, separation of data, preclusion of eavesdropping, etc. In such a system having authentication, legitimate clients would be obviously added to the client link tree (or removed from the tree based on, e.g., operational status). Illegitimate clients would be excluded from the network and, obviously, removed from the client link tree so as to avoid use of the illegitimate client.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '496 Patent – Claims	Network Analysis References
packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal.

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	Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a

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	station." Hahn at 42.
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps:

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	STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical

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	algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater.

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	… Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an

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	acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity

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	matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927.

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	"The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region.

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	b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

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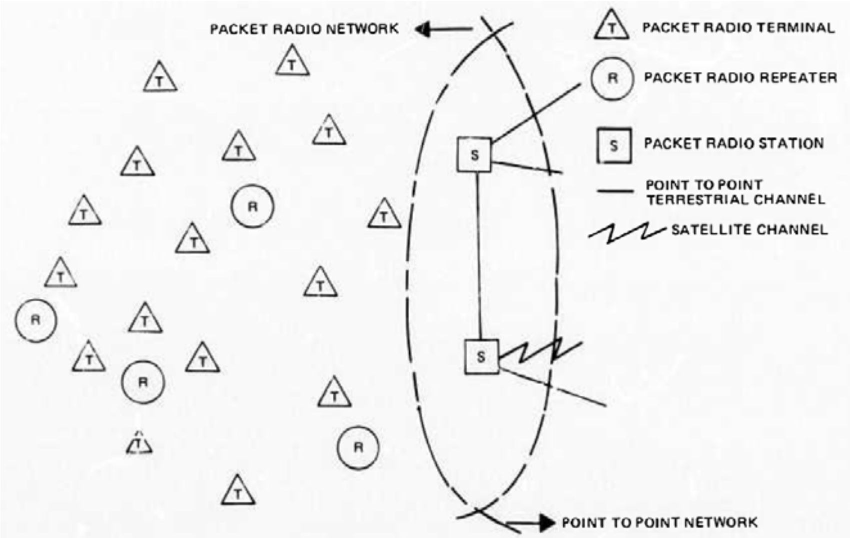
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1.

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	See also NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any

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	repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global

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wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number

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	of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

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	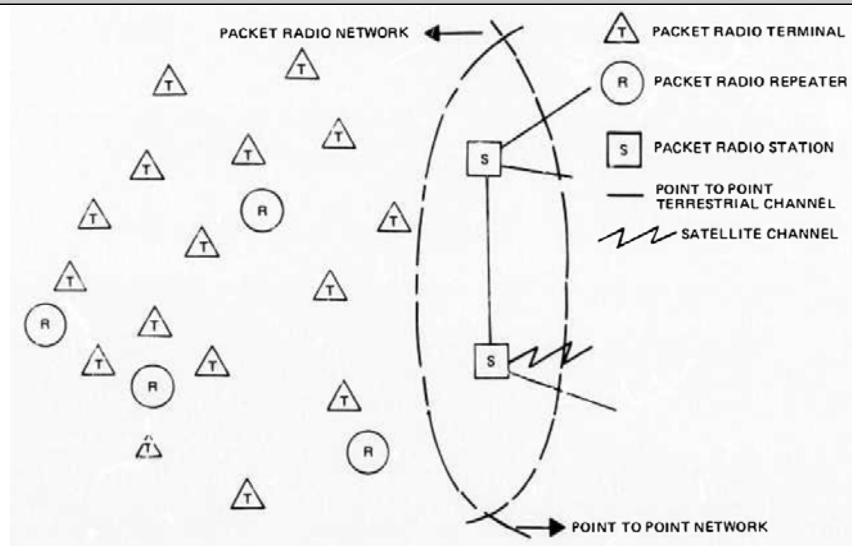 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

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receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above

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	repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at

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	927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the

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	failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928.

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	"This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33.

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	"The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled ...

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	STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown

The '496 Patent – Claims	Network Analysis References
	in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment, it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to

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	distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
45. A first node for use in wireless network system including a plurality	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure

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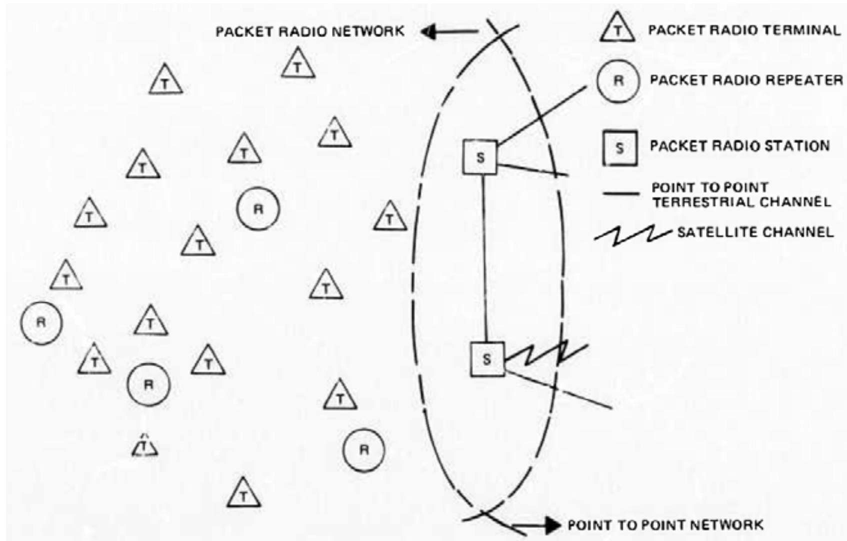
of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.  Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10.

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	See also NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals.

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	e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '496 Patent – Claims	Network Analysis References
	"Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928.

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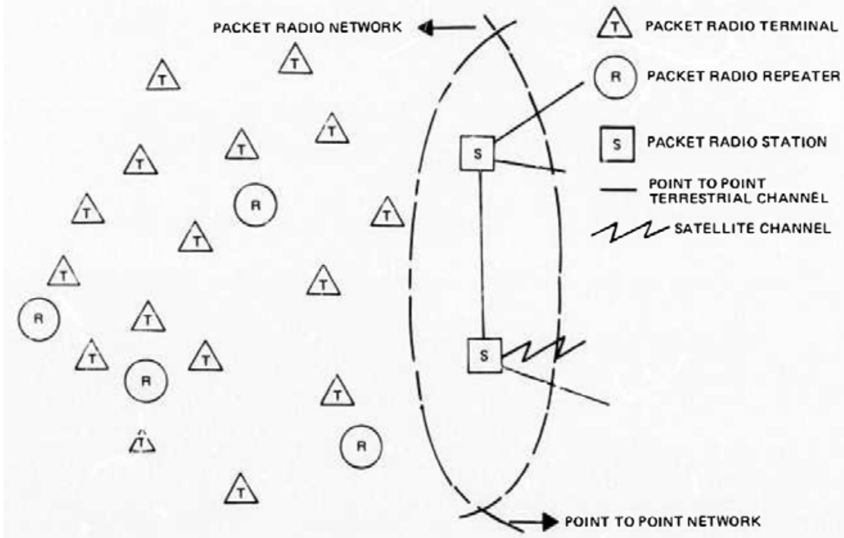
	"This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"There are three basic functional components of the Packet Radio System: the Packet Radio Terminal, the Packet Radio Station, and the Packet Radio Repeater. (See Figure 10.1.) Packet Radio Terminals will be of various types, including personal digital terminals, TTY-like devices, unattended sensors, small computers, display printers, and position location devices." NAC Dec. 1974, § 10.1.

Exhibit B3 – Invalidity Chart for Brownrigg Family based on Network Analysis Corporation References

The '496 Patent – Claims	Network Analysis References
	 Figure 10.1: Packet Radio System "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")).

The '496 Patent – Claims	Network Analysis References
	"The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42. "In some applications the Packet Radio Station will be the interface component between the broadcast system and a point-to-point network. As such it will have broadcast channels into the Packet Radio System and Link channels into the point-to-point network. In addition, it will perform accounting, buffering, directory, and routing functions for the overall system." NAC Dec. 1974, § 10.1. "Repeaters Functional capabilities for repeaters include: a . Calculating packet checksum. b. Packet storage and retransmission. c. Capabilities by which a station can determine whether a particular repeater (or any repeater in a particular area) is operative or dead. d. Capabilities 1, 3, and 4 of terminals. e. Capabilities, dependent on the routing strategy, for calculating the most efficient next repeater on a transmission path to a station or to a terminal. Stations

The '496 Patent – Claims	Network Analysis References
	Among the stations' functional capabilities are: a. A directory of terminals and repeaters in its region. b. Operations necessary to convert packets from the Packet Radio System into packets used in the point-to-point network and conversely. c. Storage buffers for packets received from terminals and for packets to be transmitted to terminals. d. Storage for character position information for active terminals which do not have this capability. e. Accounting capabilities. f. Capabilities related to routing, flow control, and network management." NAC Dec. 1974, § 10.2.1. *See also* NAC Dec. 1973 at §§ 9-10. *See also* NAC Jun. 1974 at pp. 7.1-7.52 (discussing packet handling in the packet radio network having hierarchical routing); 7.69-70 (discussing labeling and discovery of creation of network topology ("connectivity matrix")). "The network model we examine contains a large number of nodes using random transmission schemes and omnidirectional antennas. The network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional capabilities such as gateway, global control, global initialization, accounting, and directory functions, is called a station." Gitman at 927. "Typically, a radio network contains two types of nodes. A node with origination, destination, and relay functions is called a repeater. A node with additional processing capabilities such as control, initialization, and accounting is called a station." Hahn at 42.

The '496 Patent – Claims	Network Analysis References
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"The station will determine and assign labels to all repeaters in its area in the initial labeling procedure. When more than one station operates in an area, the initial labeling will be done by the stations sequentially, and repeaters may be allowed to choose the home station according to the minimum number of hops." NAC Dec. 1973 at pp. 10.27-10.33. "The information acquired from the response packets is sufficient to determine a hierarchical labeling structure. In this step, the station processes the information and determines an "optimized" structure. The processing performed during this step is described in the next section." NAC Dec. 1973 at pp. 10.27-10.33. "The approach that we adopted is to use the flooding routing algorithm to load repeaters with hierarchical labels. The flooding algorithm was selected because it does not require any knowledge of the topology of the network. A process for repeater initialization and labelling which has been detailed in [6] is currently under implementation. Initially, it is assumed that the station contains a set of fixed identifiers of repeaters which may possibly be connected into a network; three stages are then followed. In stage 1 the station transmits special control packets to the above repeaters, and repeaters respond with control packets from which a connectivity matrix between repeaters is established. The hierarchical labels are determined in stage 2 from the connectivity matrix. In stage 3 the station transmits the labels to repeaters and tests each path in both directions, from station to repeater and from repeater to station." NAC Jun. 1974 at pp. 7.69-70. "The process contains three steps: STEP I

The '496 Patent – Claims	Network Analysis References
	Mapping the network connectivity. This is obtained by a process in which stations transmit packets to repeaters, requesting each to respond with a trace packet into which every repeater along the path adds its fixed ID. STEP II Determining network structure. The connectivity information obtained above is used to obtain a network structure which has several properties; for example, it enables every packet to be routed along the shortest path (minimum number of hops); it determines the repeaters which are not needed for relaying packets and which should be temporarily disabled … STEP III In this step, the stations transmit the structure information to repeaters and test each path in both directions." NAC Dec. 1974 at pp. 11.6-11.8. "The broadcast routing algorithm floods either the network or a subset of nodes. Flooding can be utilized by stations to map network connectivity so that routing information can be assigned to repeaters to obtain more efficient routing." Gitman at 927. "The routing strategy identifies shortest path (minimum hop) between repeaters and stations, and prevents, wherever possible, generation of duplicate copies of packets. The routing is sufficiently flexible to allow departures from the first choice path and use of next shortest paths." Gitman at 928. "Furthermore, the fact that all packets are routed via a station, in the hierarchical algorithm, enables easy monitoring of network connectivity and faster updating of

The '496 Patent – Claims	Network Analysis References
	labels." Gitman at 930. "In single-station hierarchical routing, it is required that the central site be aware of the complete network topology. This information is acquired by having the central site send broadcast probe packets periodically. Each repeater responds to a probe by sending an answer packet. When a repeater forwards an answer packet due to another repeater, it appends its identification to the packet. From the returned answers. the central site can easily determine the shortest path to each repeater. Upon learning the new topology, the central site assigns routing information to repeaters. This information assigned by a station is called a label. The set of repeater labels forms a hierarchical tree structure of repeaters rooted at the station, as shown in Fig. 2. The labels may be changed during network operation when changes in network topology occur." Hahn at 43. "Suppose that L_{ij} along the shortest path is not successful in transmitting the packet to $h(L_{ij})$. Then L_{ij} begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1973. "Suppose that Lij along the shortest path is not successful in transmitting the packet to h(Lij). Then Lij begins the search stage of trying to identify another repeater. … Note that if repeaters have sufficient storage, they can save alternative labels and thus reduce the necessity of searching for a specific repeater. " NAC Dec. 1974 at pp. 13.6. "In a multistation network, repeaters are assigned labels by several stations during

The '496 Patent – Claims	Network Analysis References
	initialization. Repeaters determine primary label, secondary label, etc., according to distance, in number of hops, to the corresponding stations. Order may be changed upon changes in network topology." Gitman at 928. "Transmission power is increased when blocking is encountered, instead of the ALL indicator. All repeaters on the preferred path that are closer to the destination can accept the packet. The advantage of this technique is that one can shorten the number of hops to the destination and bypass failed repeaters." Gitman at 928. "This generalization involves the search for an alternate repeater when encountering blocking. A 'search' protocol uses a search packet specifying the class of repeaters sought. A response by such a repeater contains the hierarchical label of the responding repeater. The searching repeater substitutes the label of the responding repeater into the original packet and transmits the packet." Gitman at 929. "If a repeater along the required path has failed, all is not lost. When a repeater exceeds its allowed number of retransmissions without receiving an acknowledgment., it can set a bit in the header instructing all repeaters to adopt the flooding algorithm for the packet. This begins an alternate routing procedure and a failed or temporarily busy repeater may be bypassed. It could also announce the failure to the central site, requesting the central site to conduct another probe and relabel the tree. Another alternate routing method when blocking is encountered is simply to turn up its transmission power and hope to skip over the failed repeater." Hahn at 44.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The Meier references include descriptions relating to hierarchical routing in a packet radio network. The references include:

1. U.S. Patent No. 5,394,436 (Meier '436)
2. U.S. Patent No. 5,295,154 (Meier '154)
3. WO 95/12942 (Meier '942)
4. U.S. Patent No. 5,940,771 (Gollnick)

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Meier References
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

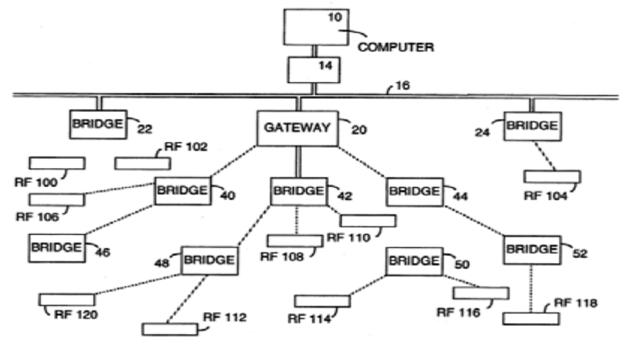
The '516 Patent – Claims	Meier References
packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '516 Patent – Claims	Meier References
	100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows.

The '516 Patent – Claims	Meier References
	Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '516 Patent – Claims	Meier References
	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length)

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '516 Patent – Claims	Meier References
	RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the

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	root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal

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consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then

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	all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

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2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 1) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to use the TCP/IP protocol to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. TCP/IP was known to be a reliable, and well-used, protocol for such communications.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '516 Patent – Claims	Meier References
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 2) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to use the TCP/IP protocol to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. TCP/IP was known to be a reliable, and well-used, protocol for such communications.

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5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 3) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to use the TCP/IP protocol to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. TCP/IP was known to be a reliable, and well-used, protocol for such communications.

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	It also would have been obvious to include a packet type and source route path to packets received by the gateway in order to provide a defined route to a terminal. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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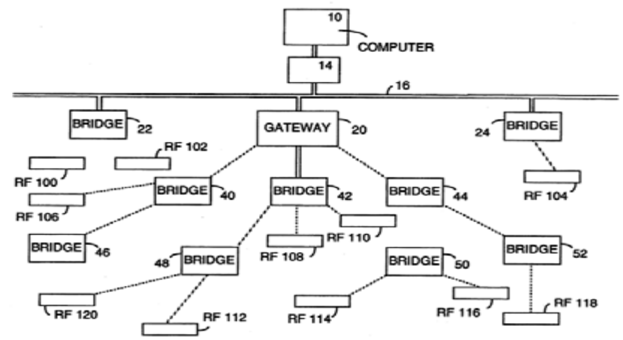
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals

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The '516 Patent – Claims	Meier References
	100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows.

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	Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

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	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length)

The '516 Patent – Claims	Meier References
	RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. "As a result of the backward learning, once the root node receives the ATTACH.request packet, an ATTACH.response packet can be sent through the spanning tree to the bridge requesting attachment." Meier '436 at 5:36-39. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table

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gateway through the fastest clients.	of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its

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	attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28.

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from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	"In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 4) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to use the TCP/IP protocol to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. TCP/IP was known to be a reliable, and well-used, protocol for such communications.
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and

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network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in

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	DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a

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	base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the

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	bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

Invalidity Chart for U.S. Patent No. 8,000,314

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1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

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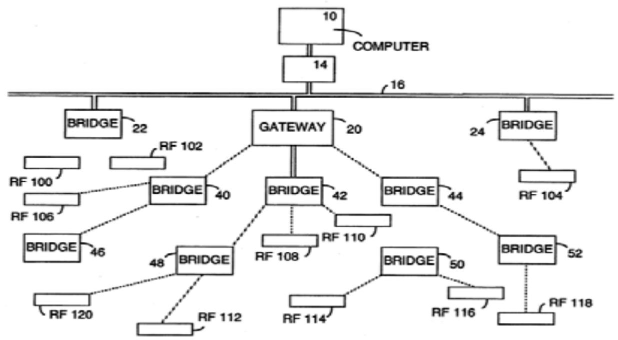
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11.

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	"The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract.

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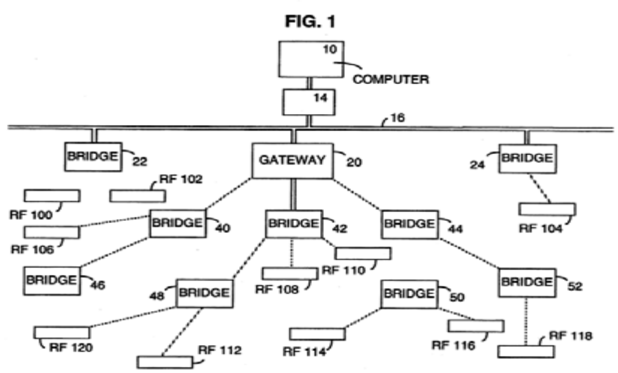
node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	"In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: 

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	"Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset

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	priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-

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	10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is

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	overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-

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	like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a

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	base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the

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	bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6.

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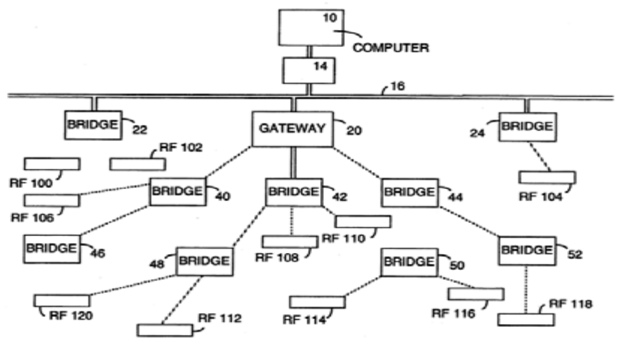
including receiving and transmitting data packets via said client modem;	"The present invention comprises an RF Local Area Network..." Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the

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	root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node

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	consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the

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	network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

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	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").

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selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO

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	packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44

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	send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end

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	ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the

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	bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the

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	bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately

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	according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message,

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	from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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optimized transmission path.	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and

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	the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be

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	reversed." Meier '436 at 4:54-5:19.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

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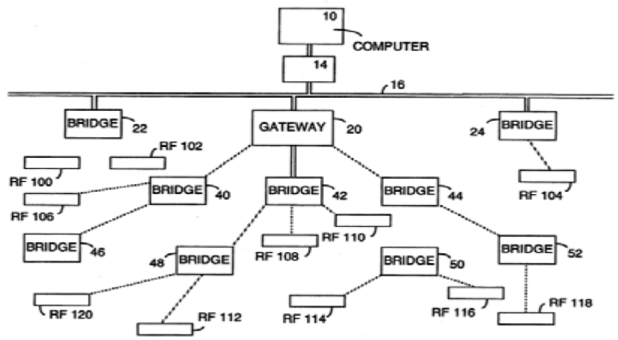
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

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	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a

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	DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42.

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	"Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 5) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-

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	record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. For example, TCP/IP was known to be a reliable, and well-used, protocol for such communications.
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system

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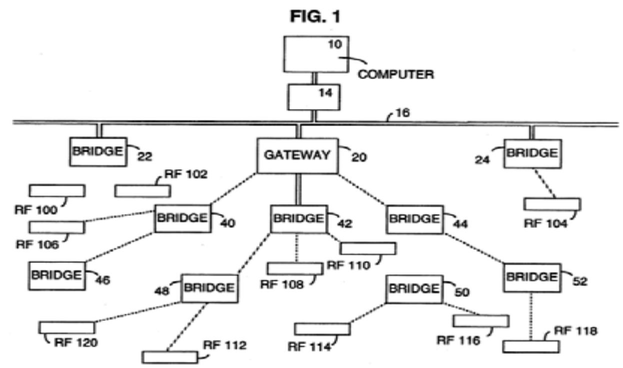
data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer

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	10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43.

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	"A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for

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	terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be

The '314 Patent – Claims	Meier References
	reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and

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the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in

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	DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

Invalidity Chart for U.S. Patent No. 8,233,471

The '471 Patent – Claims	Meier References
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

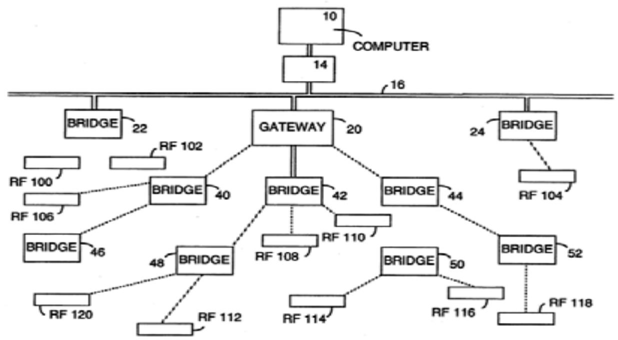
The '471 Patent – Claims	Meier References
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '471 Patent – Claims	Meier References
	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

The '471 Patent – Claims	Meier References
	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

The '471 Patent – Claims	Meier References
	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '471 Patent – Claims	Meier References
	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of

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	polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge

The '471 Patent – Claims	Meier References
	attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node

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	20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

The '471 Patent – Claims	Meier References
	"Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17.

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	"Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60.

The '471 Patent – Claims	Meier References
	"All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the

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	attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

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path, and send the optimized transmission path for each of the clients to the respective clients.	"Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge

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	determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
3. A wireless network system as recited in claim 2, wherein said server	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host

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process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11. "The responsibilities of the transport layer include the following. 6) Establishing and maintaining TCP-like connections for reliable root-to-terminal data transmission." Meier '436 at 11:20-23. "The transport layer provides reliable, unreliable, and transaction-oriented services. Two types of transport connections are defined: l) a TCP-like transport connection may be explicitly requested for long-lived connections or 2) a VMTP-like connection-record may be implicitly set up for transient connections. In addition, a connectionless service is provided for nodes which support an end-to-end transport connection with the host computer." Meier '436 at 16:54-62. It would have been obvious for a person of ordinary skill to use the TCP/IP protocol to transfer messages along data link 16 in Meier '436, e.g., translating messages from a host computer to another computer and vice versa, in order to provide a protocol for sending and receiving packets in a connection-oriented manner. TCP/IP was known to be a reliable, and well-used, protocol for such communications.
4. A wireless network system as recited in claim 3, wherein said server	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it

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process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18.

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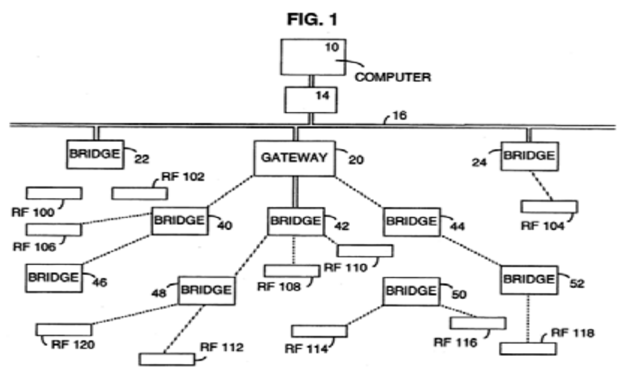
	"FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF

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	links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the

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	software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable

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	services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said server that is one of a direct link to	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the

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said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO

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	packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the

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	data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

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	to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the

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	packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must

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	remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent

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	the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.

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wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a

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	child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment

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	if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by

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	sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge

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	forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37.

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	"After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data

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	packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the

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	contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.)

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	2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree.

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	For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically,

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	SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system."

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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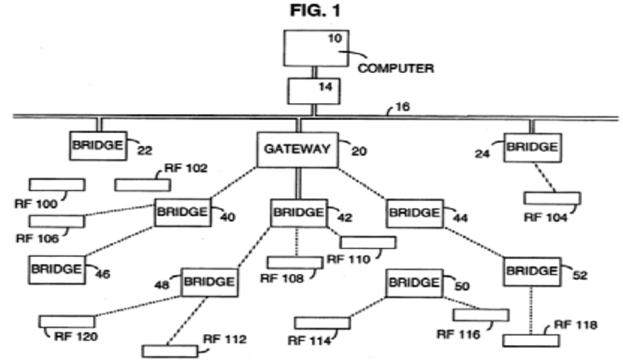
including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48.

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	"Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all

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	non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is

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	responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

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	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver

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	SST or UHF (701)").
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets

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	and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44

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	request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node

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	returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When

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	the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO

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	message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each

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	node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path.

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	4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly.

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transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop

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	in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note

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	that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the

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	ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only

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	nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44.

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	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	"Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops

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	needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the

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	message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old

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	path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
12. A method as recited in claim 11, wherein said server process further	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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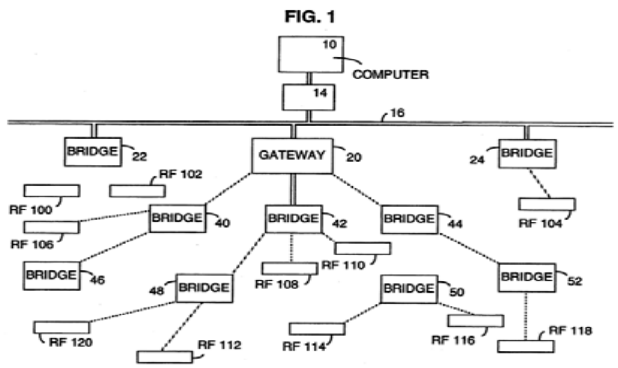
	incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer

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	10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43.

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	"A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for

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	terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be

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	reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The

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clients,	gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge

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	determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For

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	example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

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	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data

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	packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child

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	base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists.

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	5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

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	"Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
wherein the server process:	"The attached node acknowledges the ATTACH.request and sends the

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the

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	DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

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	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node

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	which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how

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	to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After

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	receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer

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	directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge

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	attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a

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	child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new

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	path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.

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16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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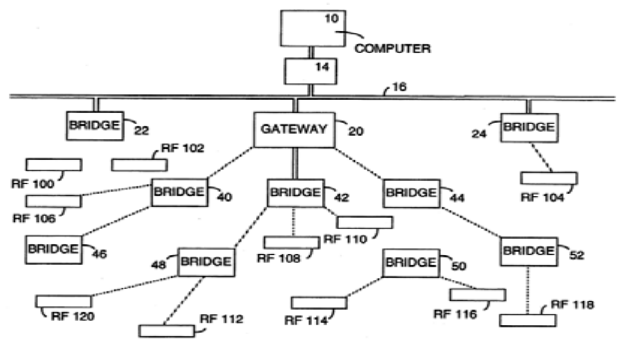
implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A

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	bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-

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	oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").

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wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and

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	ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the

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	ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and

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	all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its

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	routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the

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	logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the

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	routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node

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	can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal

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	that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then

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	all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

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18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets

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	and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44

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	request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node

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	returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When

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	the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO

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	message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each

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	node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path.

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	4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks."

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plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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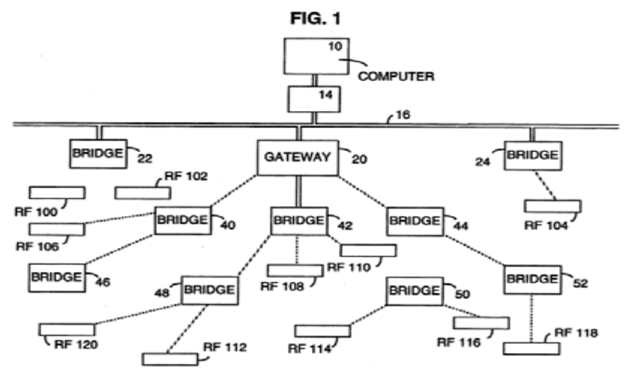
memory, and	18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link

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	and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service

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	detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is

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	sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a link to said first node that	"To initialize the RF data communication system, the gateway 20 and the other nodes

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is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication

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	network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached

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	bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly.

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	This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal.

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	If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is

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	overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the

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	node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED

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	LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

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	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a

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	DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state.

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	Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the

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	gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the

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	ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with

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	another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the

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	attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning

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	tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path.

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	4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
22. A wireless system as recited in claim 21, wherein the first node process further includes:	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks."

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logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through

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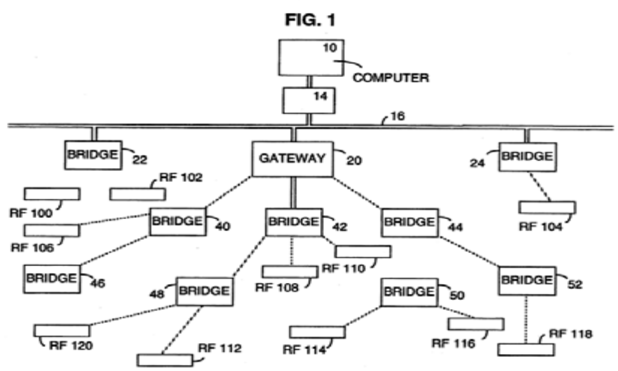
receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	"Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a

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	bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer

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	A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment

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	if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000."

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	Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state.

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	Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the

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	gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the

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	ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with

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	another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the

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	attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning

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	tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path.

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	4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
the first node process further comprises maintaining a second node link tree having second node link entries.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and

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	all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in

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	DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to

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	the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is

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	discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an

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	appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the

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	data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one

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	exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing

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	tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F.	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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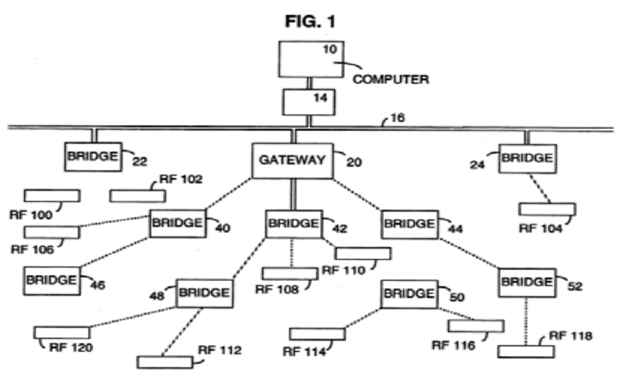
transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: 

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	"Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset

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	priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-

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	10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is

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	overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-

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	like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to

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	the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is

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	discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an

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	appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the

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	data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one

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	exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing

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	tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.

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maintaining a second node link tree having second node link entries at the first node.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node

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	information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to

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	the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices)

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	attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37.

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	"After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent

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	node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge

The '471 Patent – Claims	Meier References
	determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node

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	is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree.

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	For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is

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	CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem;	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the

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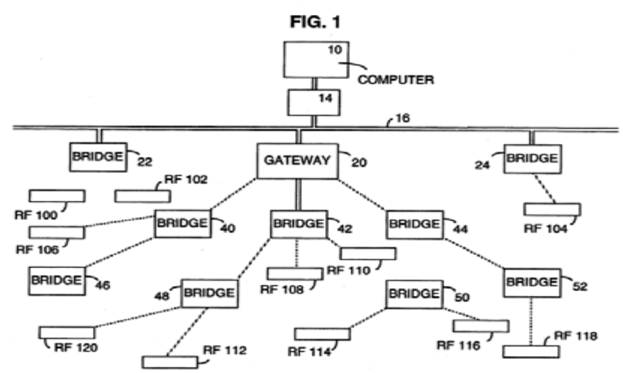
and a server node controller implementing a server process, said server process configured to: receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at

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	2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal

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	nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '471 Patent – Claims	Meier References
	A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a

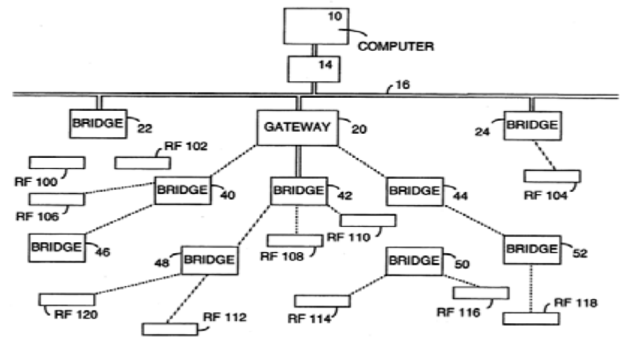
The '471 Patent – Claims	Meier References
	particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the

The '471 Patent – Claims	Meier References
	packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

The '471 Patent – Claims	Meier References
	to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11.

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	Meier References
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

The '496 Patent – Claims	Meier References
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

The '496 Patent – Claims	Meier References
	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

The '496 Patent – Claims	Meier References
	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11.

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client link entries representing each of the plurality of clients.	"The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and

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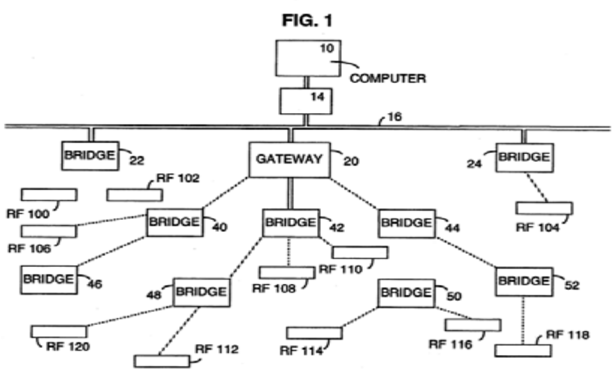
controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: 

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	"Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single

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	root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The

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	MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the

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	bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle)

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	The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet.

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	The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and

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	221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically

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	broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its

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	attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.)

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	2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the

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	spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any

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	changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42.

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	"Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast.

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	By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets

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	(at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root

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	node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer,

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	the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes

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	attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and

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	is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant.

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	If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	"The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36.

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	"Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically

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	closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal."

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	Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

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	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network

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	entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root,

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	must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO

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	packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66.

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	"Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same

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	branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39.

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	"When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier

The '496 Patent – Claims	Meier References
	'436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

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	"DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes

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	remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the

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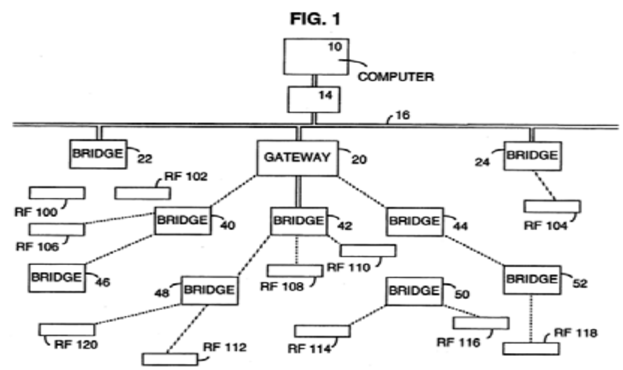
	LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19.

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	"In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station

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	contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

The '496 Patent – Claims	Meier References
	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of

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	polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge

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	attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node

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	20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	"Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17.

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	"Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

The '496 Patent – Claims	**Meier References**
	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal.

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	IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal

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	address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The

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transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge

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	determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For

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	example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

The '496 Patent – Claims	Meier References
	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data

The '496 Patent – Claims	Meier References
	packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child

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	base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the

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	sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

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	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10.

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	"Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer.

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	Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table

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	for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES

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	CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED

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	LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the

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correspond to the server selected transmission path between the server and the respective client.	optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO

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	packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the

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	data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

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	to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the

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	packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must

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	remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station,

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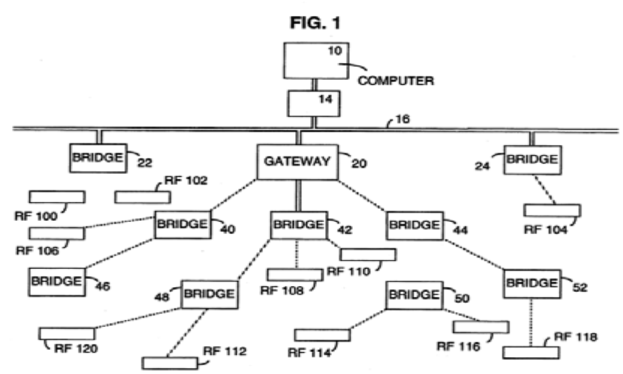
housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are

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	sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc.

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	2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3.

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	"Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks

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	having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5.

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	U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35.

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	"The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36.

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	"Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44.

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	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65.

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	"Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

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	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to

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	deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-

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	end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein the server process: receives information identifying the	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the

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selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO

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	packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the

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	data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

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	to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the

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	packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must

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	remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent

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	the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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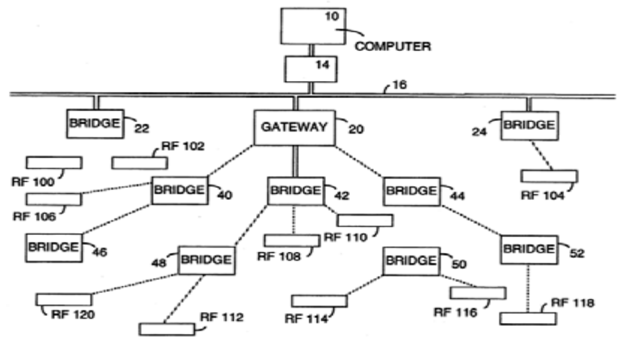
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11.

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	"The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node.

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plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the

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	contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42.

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	However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent

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	the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436

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	at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment

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	if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next

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	hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists.

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	5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which

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	flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops

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	needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request

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	packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer.

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	However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base

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	station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note

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	that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE

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	DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from

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	its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a

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between the server and the respective client.	status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes

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	attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal

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	that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals

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	is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks

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	having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the

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	terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists.

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	During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the

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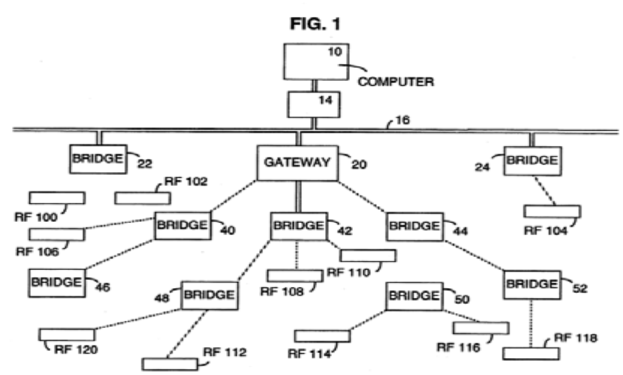
client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at

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	2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal

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	nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer

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	A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a

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	particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only

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	nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44.

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	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65.

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	"Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops

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	needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the

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	message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old

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	path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein the server process: receives information identifying the selected transmission path from each	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a

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of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes

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	attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal

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	that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals

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	is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks

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	having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the

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	terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists.

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	During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

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	"Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.

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17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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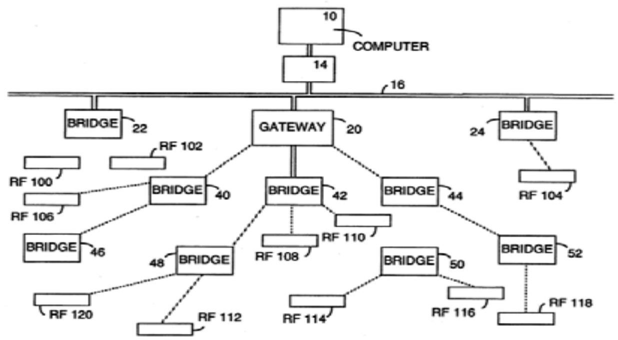
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11.

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	"The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly.

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transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop

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	in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35.

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	"The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	"Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically

The '496 Patent – Claims	Meier References
	closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal."

The '496 Patent – Claims	Meier References
	Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node.

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	The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network

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	entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root,

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	must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.

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19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal

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	address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
21. A wireless network system comprising: a first node including a first node	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal

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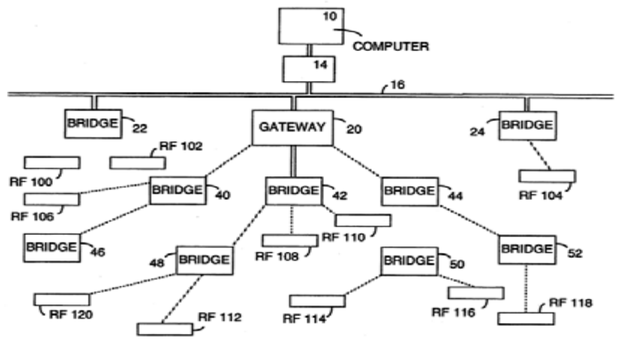
controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11.

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	"The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its

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	attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20

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	and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

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	"Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17.

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	"Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

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	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal.

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	IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state

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	whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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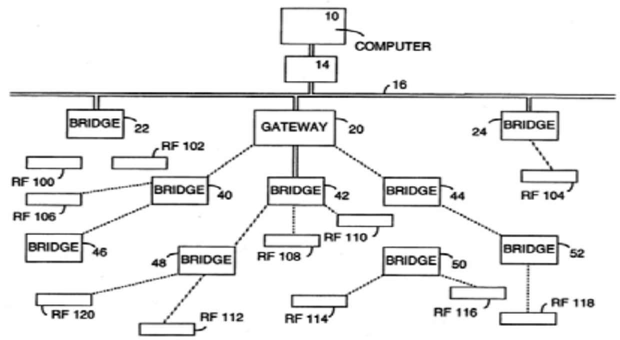
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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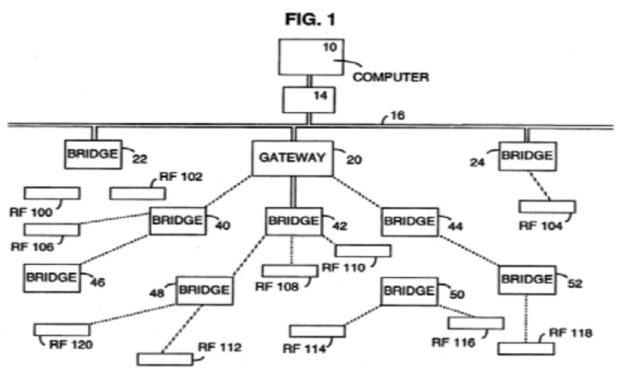
	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	"FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF

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	links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the

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	software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable

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	services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
maintaining a second node link tree having second node link entries	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node

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representing each of the plurality of second nodes; dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the

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	following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet.

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	The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and

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	221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically

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	broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to

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	the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its

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	attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.)

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	2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the

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	spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any

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	changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal

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node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

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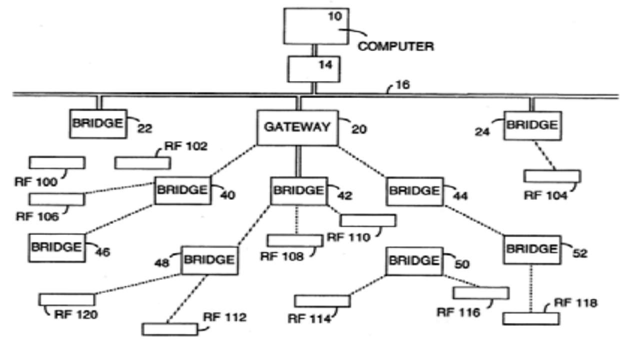
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes, dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

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inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a

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	DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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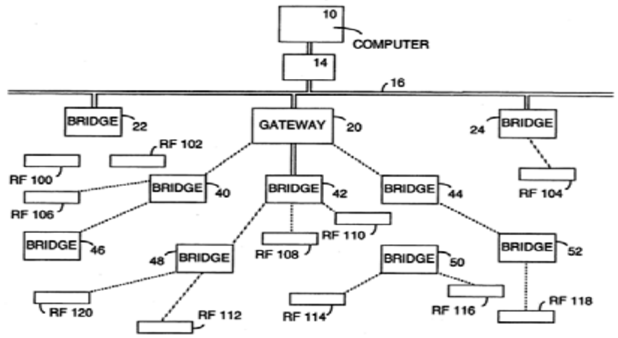
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

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	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-

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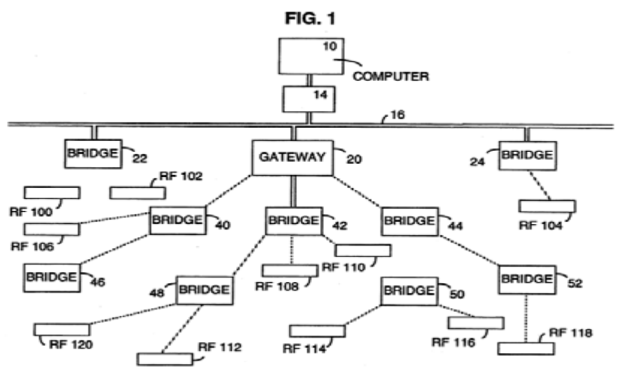
	18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link

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	and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function.

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	3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service

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	detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is

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	sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
initiating a radio transmission path to	"To initialize the RF data communication system, the gateway 20 and the other nodes

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a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication

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	network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached

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	bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly.

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	This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal.

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	If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is

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	overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the

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	node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED

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	LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station,

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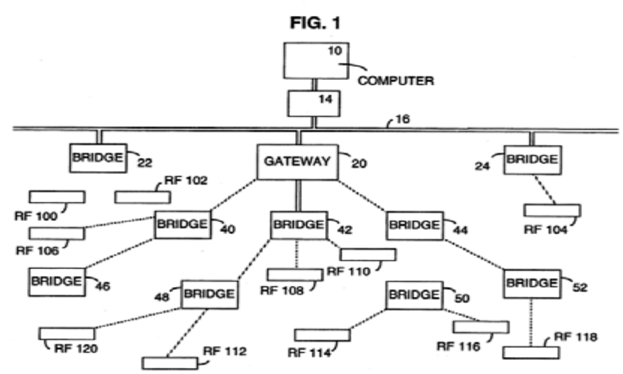
data packets via said first node radio modem; and	the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are

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	sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc.

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	2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3.

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	"Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks

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	having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5.

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	U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry

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	includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13.

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	"Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the

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	attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up

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	the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from

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	other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an

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	upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be

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	reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED.

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	When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the

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	detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks." Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
36. In a wireless network system comprising a plurality of second	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one

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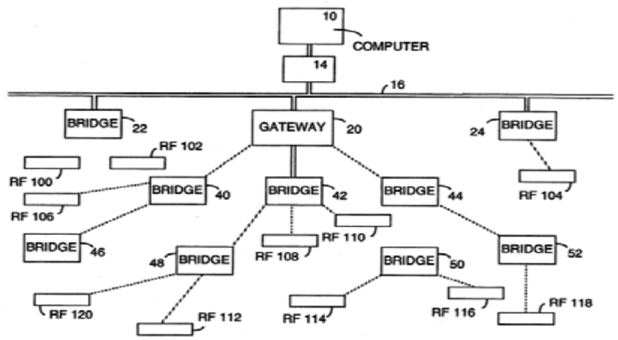
nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network

The '496 Patent – Claims	Meier References
	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

The '496 Patent – Claims	Meier References
	network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

The '496 Patent – Claims	Meier References
	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

The '496 Patent – Claims	Meier References
	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

The '496 Patent – Claims	Meier References
	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:

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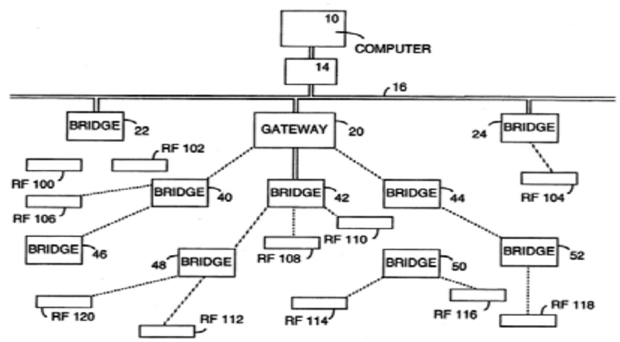
<tr><th>The ‘496 Patent – Claims</th><th>Meier References</th></tr>
<tr><td></td><td>
FIG. 1


“Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree.” Meier ‘436 at 2:44-48.

“Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10.” Meier ‘436 at 3:9-19.

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	controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68.

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	"HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically

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	closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using

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	the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals

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	(i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to

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	the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT

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	PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-

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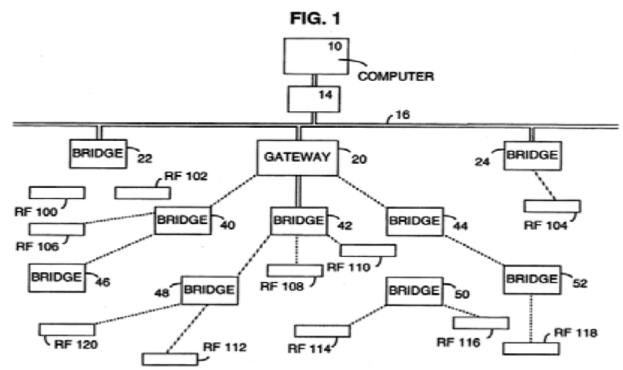
	18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link

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	and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function.

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	3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service

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	detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is

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	sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
selecting a transmission path to said	"To initialize the RF data communication system, the gateway 20 and the other nodes

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first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication

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	network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached

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	bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly.

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	This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal.

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	If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is

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	overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the

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	node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED

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	LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing

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	table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a

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	DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state.

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	Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the

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	gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the

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	ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with

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	another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the

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	attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning

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	tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path.

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	4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
39. A method as recited in claim 37, wherein said first node process further includes:	"In alternate embodiments of the present invention, the RF Networks contain multiple gateways. By including a system identifier in the address field of the nodes, it is possible to determine which nodes are connected to which networks."

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determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	Moreover, it would have been obvious to implement authentication of clients and maintenance of a client link tree, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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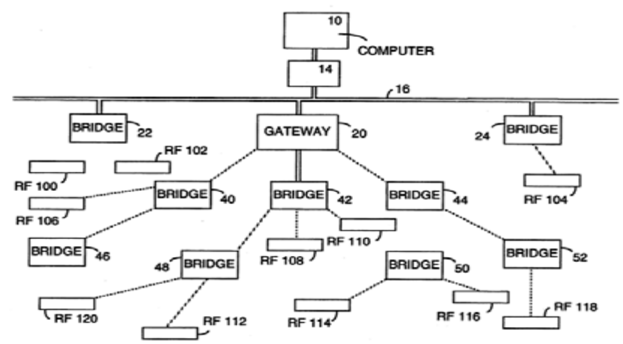
	"FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1: FIG. 1  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF

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	links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the

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	software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable

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	services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
receive information identifying selected transmission paths from each	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the

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of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

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	packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the

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	data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

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	to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the

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	packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must

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	remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent

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maintain a client link tree having client link entries representing each of the plurality of client nodes.	the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.

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41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	"Gateways are used to pass messages to and from a host computer and the RF Network. A host port is used to provide a link between the gateway and the host computer." Meier '436 at 2:26-28. "In one embodiment of the present invention, the RF data communication system has a host computer 10, a network controller 14 and bridges 22 and 24 attached to a data communication link 16. Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention." Meier '436 at 3:5-11.
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18.

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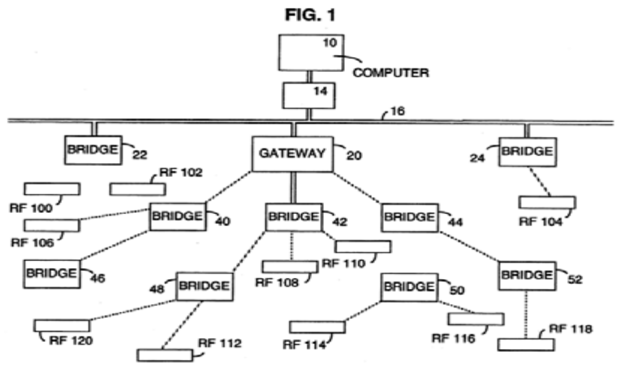
	"FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF

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	links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the

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	software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable

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	services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the

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	bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said client process of each of said clients initiates and selects a	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the

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radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO

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	packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node 20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by

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	monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the

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	data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17. "Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment

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	packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal. IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must

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	remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node. 6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the

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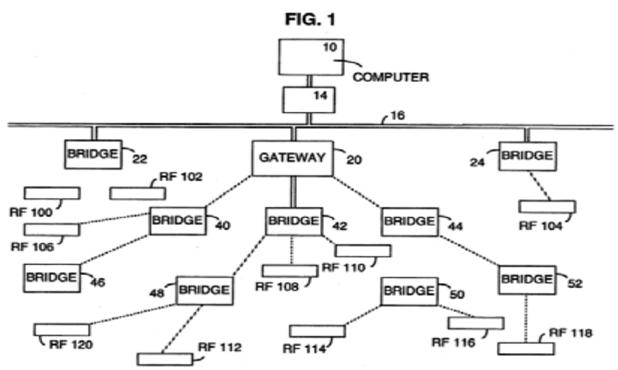
	data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at

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	2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal

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	nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer

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	A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid

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	instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a

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	particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the

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	packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal

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	address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path	"The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end

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between the server and the respective client.	ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the

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	terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network..." Meier '436 at 2:17-18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65.

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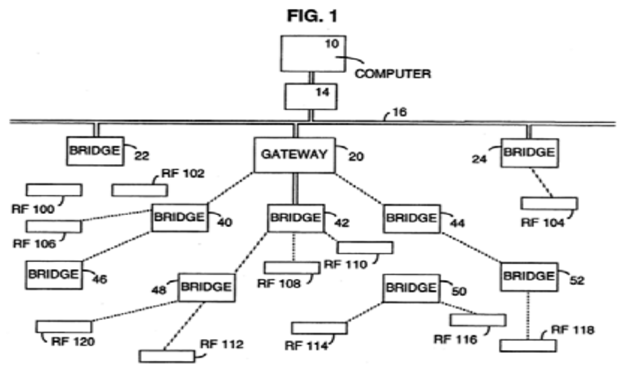
	FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19.

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	"In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function. 3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station

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	contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44.

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	"If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include:

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	CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"To initialize the RF data communication system, the gateway 20 and the other nodes are organized into an optimal spanning tree rooted at the gateway 20. To form the optimal spanning tree, in the preferred embodiment the gateway 20 is assigned a status of ATTACHED and all other bridges are assigned the status UNATTACHED. The gateway 20 is considered attached to the spanning tree because it is the root node. Initially, all other bridges are unattached and lack a parent in the spanning tree. At this point, the attached gateway node 20 periodically broadcasts a specific type of

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	polling packet referred to hereafter as 'HELLO packets'." Meier '436 at 3:56-68. "HELLO packets contain 1) the address of the sender, 2) the hopping distance that the sender is from the root, 3) a source address, 4) a count of nodes in the subtree which flow through that bridge, and 5) a list of system parameters." Meier '436 at 4:9-13. "Next, at a block 203, the bridge enters the UNATTACHED state, listening for HELLO packets (also referred to as HELLO messages herein) that are broadcast. By listening to the HELLO messages, bridges can learn which nodes are attached to the spanning tree. At a block 205, the bridge responds to a HELLO packet received by sending an ATTACH.request packet to the device that sent the received HELLO packet. The ATTACH.request packet is thereafter forwarded towards and to the root node which responds by sending an ATTACH.response packet back down towards and to the bridge." Meier '436 at 4:22-35. "The bridge awaits the ATTACH.response packet at a block 207. Upon receipt of the ATTACH.response packet, at a block 209, the bridge enters an ATTACHED state. Thereafter, at a block 211, the bridge begins periodically broadcasting HELLO packets and begins forwarding or relaying packets received. Specifically, between HELLO packet broadcasts, the bridge listens for HELLO, DATA, ATTACH.request and ATTACH.response packets broadcast by other devices in the communication network." Meier '436 at 4:36-45. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge

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	attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast." Meier '436 at 4:54-66. "Specifically, once attached, the attached bridge begins broadcasting HELLO packets (at the block 211) seeking to have all unattached bridges (or other network devices) attach to the attached bridge. Upon receiving an ATTACH.request packet, the bridge forwards that packet toward the root node (through the blocks 211, 213, 214 and 221. On its path toward the root, each node records the necessary information of how to reach requesting bridge. This process is called 'backward learning' herein, and is discussed more fully below." Meier '436 at 5:26-36. "Initially, only the root gateway node 20 is broadcasting HELLO messages and only nodes 40, 42 and 44 are within range of the HELLO messages broadcast by the gateway. Therefore, after the listening period has expired, nodes 40, 42 and 44 request attachment to the gateway node 20. The unattached nodes 40, 42, and 44 send ATTACH.request packets and the attached gateway node 20 acknowledges the ATTACH.request packets with local ATTACH.confirm packets. The newly attached bridges are assigned the status ATTACHED and begin broadcasting their own HELLO packets, looking for other unattached bridges. Again, the remaining unattached nodes attempt to attach to the attached nodes that are logically closest to the root node. For example, node 48 is within range of HELLO messages from both nodes 40 and 42. However, node 40 is three hops, via an RF link, away from the gateway root node 20 and node 42 is only one hop, via a hard-wired link, away from the gateway root node

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	20. Therefore, node 48 attaches to node 42, the closest node to the gateway root node 20." Meier '436 at 5:58-6:10. "Nodes, other than the gateway root node, after acknowledging an ATTACH.request packet from a previously unattached node, will send the ATTACH.request packet up the branches of the spanning tree to the gateway root node. As the ATTACH.request packet is being sent to the gateway root node, other nodes attached on the same branch record the destination of the newly attached node in their routing entry table. When the ATTACH.request packet reaches the gateway root node, the gateway root node returns an end-to-end ATTACH.confirm packet." Meier '436 at 6:27-37. "After the spanning tree is initialized, the RF terminals listen for periodically broadcasted Hello packets to determine which attached nodes are in range. After receiving HELLO messages from attached nodes, an RF terminal responding to an appropriate poll sends an ATTACH.request packet to attach to the node logically closest to the root." Meier '436 at 6:38-44. "The attached node acknowledges the ATTACH.request and sends the ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11.

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	"Communication between terminals and the host computer is accomplished by using the resulting RF Network. To communicate with the host computer, an RF terminal sends a data packet in response to a poll from the bridge closest to the host computer. Typically, the RF terminal is attached to the bridge closest to the host computer. However, RF terminals are constantly listening for HELLO and polling messages from other bridges and may attach to, and then communicate with, a bridge in the table of bridges that is closer to the particular RF terminal." Meier '436 at 7:28-39. "When a bridge receives a data packet from a terminal directed to the host computer, the bridge forwards the data packet to the parent node on the branch. The parent node then forwards the data packet to its parent node. The forwarding of the data packet continues until the gateway root node receives the data packet and sends it to the host computer. Similarly, when a packet arrives at a node from the host computer directed to an RF terminal, the node checks its routing entry table and forwards the data packet to its child node which is along the branch destined for the RF terminal." Meier '436 at 7:55-65. "Communication is also possible between RF terminals. To communicate with another RF terminal, the RF terminal sends a data packet to its attached bridge. When the bridge receives the data packet from a terminal directed to the host computer, the bridge checks to see if the destination address of the RF terminal is located within its routing table. If it is, the bridge simply sends the message to the intended RF terminal. If not, the bridge forwards the data packet to its parent node. The forwarding of the data packet up the branch continues until a common parent between the RF terminals is found. Then, the common parent (often the gateway node itself) sends the data packet to the intended RF terminal via the branches of the RF Network." Meier '436 at 8:4-17.

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	"Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address). When a base station receives an upstream packet (i.e., from the root, destined for a terminal) the packet is simply forwarded to the base station which is in the routing entry for the destination." Meier '436 at 14:37-48. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

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	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "DELETING INVALID ROUTING TABLE ENTRIES is accomplished in several ways: connection oriented transport layer ensures that packets will arrive from nodes attached to the branch of the spanning tree within the timeout period, unless a node is disconnected.) 2) Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree, with one exception. If the child is a SLEEPING terminal, the message is retained by the network entity in the parent for "count" hello times. The parent immediately attempts to deliver the message after it sends its next hello packet. If, after "count" hello times, the message cannot be delivered, then the child is logically detached from the spanning tree. Detached node information is propagated downstream to the root node, each node in the path of the DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal.

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	IN GENERAL, WHENEVER A NODE DISCOVERS THAT A TERMINAL IS DETACHED, IT PURGES ITS ROUTING ENTRY FOR THE TERMINAL. WHENEVER A NODE DISCOVERS THAT A BASE STATION IS DETACHED, IT PURGES ALL ROUTING ENTRIES CONTAINING THE BASE STATION. ONLY ENTRIES FOR UPSTREAM NODES ARE DELETED. When DETACH packets reach the root node, they are added to a "detached list." Nodes remain in the root node's detached list until a) the node reattaches to the spanning tree, or b) the list entry times out. The detached list is included in hello messages and is propagated throughout the spanning tree. For example, if a terminal detaches and reattaches to a different branch in the spanning tree, all downstream nodes in the new branch (quickly) "learn" the new path to the terminal. Nodes which were also in the old path change their routing tables and no longer forward packets along the old path. At least one node, the root, must be in both the old and new path. A new path is established as soon as an end-to-end attach request packet from the terminal reaches a node which was also in the old path. 4) A node (quickly) learns that it is detached whenever it receives a hello message, from any node, with its address in the associated detached list. The detached node can, optionally, send a global ATTACH.request, and then enters the UNATTACHED LISTEN state and reattaches as described above. After reattaching, the node must remain in a HOLD-DOWN state until its address is aged out of all detached lists. During the HOLD-DOWN state the node ignores detached lists. 5) A node becomes disconnected and enters the UNATTACHED LISTEN state whenever HELLO-RETRY-MAX hello messages are missed from its parent node.

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	6) A node enters the ATTACHED LISTEN state whenever a single hello message, from its parent, is missed. SLEEPING terminals remain awake during the ATTACHED LISTEN state. The state ends when the terminal receives a data or hello message from its parent. The terminal becomes UNATTACHED when a) its address appears in the detached list of a hello message from an ode other than its parent, or b) HELLO-RETRY-MAX hello messages are missed. The total number of hello slots spend in the LISTEN state is constant. If a node in the ATTACHED LISTEN state discovers a path to the root which is CHANGE-THRESHOLD shorter, it can attach to the shorter path. Periodically, SLEEPING terminals must enter the ATTACHED LEARN state to discovery any changes (i.e., shorter paths) in the network topology." Meier '436 at 14:59-16:6.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"An apparatus and a method for routing data in a radio data communication system having one or more host computers, one or more intermediate base stations, and one or more RF terminals organizes the intermediate base stations into an optimal spanning-tree network to control the routing of data to and from the RF terminals and the host computer efficiently and dynamically." Meier '436 at Abstract. "In such a system, communication from an RF terminal to a host computer may be achieved, for example, by having the RF terminal send data to an intermediate station, the intermediate station send the data to a base station, and the base station send the data directly to the host computer. Communicating with a host computer through more than one station is commonly known as a multiple-hop communication system." Meier at 1:66-2:6. "The present invention comprises an RF Local Area Network…" Meier '436 at 2:17-

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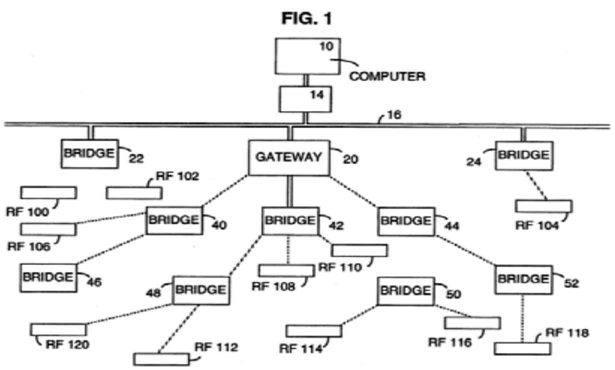
	18. "FIG. 1 is a functional block diagram of an RF data communication system incorporating the RF local-area network of the present invention." Meier '436 at 2:63-65. FIG. 1:  "Specifically, root of the spanning tree are the gateways; the branches are the bridges; and non-bridging stations, such as RF terminals, are the leaves of the tree. Data are sent along the branches of the newly created optimal spanning tree." Meier '436 at 2:44-48. "Also attached to the data communication link 16 is a gateway 20 which acts as the root node for the spanning tree of the RF data network of the present invention. A bridge 42 is attached to the gateway 20 through a hard-wired communication link

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	and bridges 40 and 44 are logically attached to gateway 20 by two independent RF links. Additional bridges 46, 48, 50 and 52 are also connected to the RF Network and are shown in the FIG. 1. Note that, although shown separate from the host computer 10, the gateway 20 (the spanning tree root node) may be part of host computer 10." Meier '436 at 3:9-19. "In the preferred embodiment, the host computer 10 is an IBM 3090, the network controller 14 is a model RC3250 of the Norand Corporation, the data communication link 16 is an Ethernet link, the nodes 20, 22, 24, 40, 42, 44, 46, 48, 50 and 52 are intelligent base transceiver units of the type RB4000 of the Norand Corporation, and the RF terminals 100, 102, 104, 106, 108, 110, 112, 114, 116, 118 and 120 are of type RT1100 of the Norand Corporation." Meier '436 at 3:40-48. "Devices in the spanning tree are logically categorized as one of the following three node types: 1) Root (or root bridge)--A controller device which functions as the root bridge of the network spanning tree. In the preferred embodiment, the spanning tree has a single root node. Initially, all controllers are root candidates from which a root node is selected. This selection may be based on the hopping distance to the host, preset priority, random selection, etc. 2) Bridge--An internal node in the spanning tree which is used to "bridge" terminal nodes together into an interconnected network. The root node is also considered a bridge and the term "bridge" may be used to refer to all non-terminal nodes or all non-terminal nodes except the root, depending on the context herein. A bridge node consists of a network interface function and a routing function.

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	3) Terminal--leaf node in the spanning tree. A terminal node can be viewed as the software entity that terminates a branch in the spanning tree." Meier '436 at 9:16-43. "A controller device contains a terminal node(s) and a bridge node. The bridge node is the root node if the controller is functioning as the root bridge. A base station contains a bridge node. A terminal device contains a terminal node and must have a network interface function. A 'bridging entity' refers to a bridge node or to the network interface function in a terminal." Meier '436 at 9:37-43. "The software for the spread-spectrum system is functionally layered as follows. Medium Access Control (MAC) The MAC layer is responsible for providing reliable transmission between any two nodes in the network (i.e. terminal-to-bridge). The MAC has a channel access control component and a link control component. The link control component facilitates and regulates point-to-point frame transfers in the absence of collision detection. The MAC channel access control component regulates access to the network. Note that herein, the MAC layer is also referred to as the Data Link layer." Meier '436 at 9:60-10:3. "Logical Link Control Layer A logical link control layer, also known herein as the Transport layer herein, is responsible for providing reliable transmission between any two nodes in the network (i.e., terminal-to-base station). The data-link layer provides a connection-oriented reliable service and a connectionless unreliable service. The reliable service

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	detects and discards duplicate packets and retransmits lost packets. The unreliable services provides a datagram facility for upper layer protocols which provide a reliable end-to-end data path. The data-link layer provides ISO layer 2 services for terminal-to-host application sessions which run on top of an end-to-end terminal-to-host transport protocol. However, the data-link layer provides transport (ISO layer 4) services for sessions contained within the SST network." Meier '436 at 10:29-44. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value. If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is

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	sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19. "The interfaces to the next upper (i.e., application) layer include: CONNECT (access.sub.-- point, node.sub.-- name) LISTEN (access.sub.-- point) UNITDATA (access.sub.-- point, node.sub.-- name, buffer, length) SEND (handle, buffer, length) RECEIVE (handle, buffer, length) CLOSE (handle) The 'handle' designates the connection type, and is the connection identifier for TCP-like connections." Meier '436 at 16:63-17:5. U.S. Patent No. 5,940,771 (Gollnick) at Figure 7 "shows a block diagram of a particularly preferred intelligent base transceiver unit known as the RB4000." Gollnick at 11:37-38 ("RF Base Intelligent Controller (7-70)"; "Base Radio Transceiver SST or UHF (701)").
dynamically updating a second node	"The attached node acknowledges the ATTACH.request and sends the

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	ATTACH.request packet to the gateway root node. Then, the gateway root node returns an end-to-end ATTACH.confirm packet. In this manner, the end-to-end ATTACH.request functions as a discovery packet enabling the gateway root node, and all other nodes along the same branch, to learn the address of the RF terminal quickly. This process is called backward learning. Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 6:66-7:11. "Nodes learn the addresses of terminals by monitoring the traffic from terminals to the root. If a packet arrives from a terminal that is not contained in the routing table of the node, an entry is made in the routing table. The entry includes the terminal address and the address of the node that sent the packet." Meier '436 at 7:6-11. "The end-to-end ATTACH.request functions as a discovery packet, and enables the root node to learn the address of the source node quickly." Meier '436 at 13:58-60. "All messages are routed along branches of the spanning tree. Base stations 'learn' the address of terminals by monitoring traffic from terminals (i.e., to the root). When a base station receives (i.e., an ATTACH.request) packet, destined for the root, the base station creates or updates an entry in its routing table for the terminal. The entry includes the terminal address, and the address of the base station which sent the packet (i.e., the hop address)." Meier '436 at 14:36-42. "Whenever the DLC entity in a parent fails RETRY MAX times to send a message to a child node, the node is logically disconnected from the spanning tree…Detached node information is propagated downstream to the root node, each node in the path of the

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	DETACH packet must adjust its routing tables appropriately according to the following rules: a) if the lost node is a child terminal node, the routing entry for the terminal is deleted and a DETACH packet is generated, b) if the node specified in DETACH packet is a terminal and the node which delivered the packet is the next hop in the path to the terminal, then the routing table entry for the terminal is deleted and the DETACH packet is forwarded, c) if the lost node is a child base station node then all routing entries which specify that base station as the next hop are deleted and a DETACH packet is generated for each lost terminal." Meier '436 at 14:65-15:20. "If at the block 213 detachment has not occurred, at a block 214, the bridge determines if the received packet is a HELLO packet. If so, the bridge analyzes the contents of the HELLO packet at a block 215 to determine whether to change its attachment point in the spanning tree. In a preferred embodiment, the bridge attempts to maintain attachment to the spanning tree at the node that is logically closest to the root node. The logical distance, in a preferred embodiment, is based upon the number of hops needed to reach the root node and the bandwidth of those hops. The distance the attached node is away from the root node is found in the second field of the HELLO message that is broadcast. In another embodiment of the present invention, the bridges consider the number of nodes attached to the attached node as well as the logical distance of the attached node from the root node. If an attached node is overloaded with other attached nodes, the unattached bridge may request attachment to the less loaded node, or to a more loaded node as described above in networks having regions of substantial RF overlap. In yet another embodiment, to avoid instability in the spanning tree, the bridge would only conclude to change attachment if the logical distance of the potential replacement is greater than a threshold value.

Exhibit B4 – Invalidity Chart for Brownrigg Family based on the Meier references

The '496 Patent – Claims	Meier References
	If no change in attachment is concluded, at a block 217 the bridge branches back to the block 211. If a determination is made to change attachment, a DETACH packet is sent to the root as illustrated at a block 219. After sending the DETACH packet, the bridge branches back to the block 205 to attach to the new spanning tree node. Note that the order of shown for detachment and attachment is only illustrative and can be reversed." Meier '436 at 4:54-5:19.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

The Dynamic Source Routing references include descriptions relating to routing in an ad hoc radio network. The references include:

1. D. B. Johnson, "Routing in Ad Hoc Networks of Mobile Hosts," Proc. of the IEEE Workshop on Mobile Computing Systems and Applications at 158-163 (Dec. 8-9, 1994) (Johnson 1994)
2. D.B. Johnson and D. Maltz, "Dynamic Source Routing in Ad Hoc Wireless Networks," Paper (prior to Feb. 29, 1996) (Johnson and Maltz).
3. D.B. Johnson and D. Maltz, "Dynamic Source Routing in Ad Hoc Wireless Networks," Mobile Computing, Chapter 5, pp. 153-181 (Imielinski and Korth, eds. Feb. 1996) (Mobile Computing).

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Dynamic Source Routing References
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

The '516 Patent – Claims	Dynamic Source Routing References
communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

The '516 Patent – Claims	Dynamic Source Routing References
	to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17.

The '516 Patent – Claims	Dynamic Source Routing References
	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

The '516 Patent – Claims	Dynamic Source Routing References
	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

The '516 Patent – Claims	Dynamic Source Routing References
	"Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet,

The '516 Patent – Claims	Dynamic Source Routing References
	reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing

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	it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply

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	is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the

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more of other clients of said first network;	other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other

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	packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized

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transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Stations having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.

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10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4.

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	"In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in

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	the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on

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	its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet."

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	Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate

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	route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
11. A method as recited in claim 10:	It would have been obvious for a node in the ad hoc network to serve as a gateway to,

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wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this

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	host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this

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	packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be

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	shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

Invalidity Chart for U.S. Patent No. 8,000,314

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1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson

The '314 Patent – Claims	Dynamic Source Routing References
	1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving

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	(very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the

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	sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future

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	packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route

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	discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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wherein said selected path to said first node utilizes the least number of	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing

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other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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sender configured to send said data packet with a header to a second node of said wireless network; and	1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that

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	destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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	network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular,

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	Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167.

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	"Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

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second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3

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	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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	"Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the

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selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3.

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	"When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is

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implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection."

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communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4.

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	"In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

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	"Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the

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	interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then

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	sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more

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	frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no

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said first network to said first node can be through one or more of other second node of said first network;	new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently

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	closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the

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wherein said digital controller changes the transmission paths of each of the second nodes to optimize	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad

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the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4.

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	"While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned,

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	or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

Invalidity Chart for U.S. Patent No. 8,233,471

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2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson

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	1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving

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	(very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the

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	sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future

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	packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route

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	discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further includes logic that maintains a client	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing

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link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no

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current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is

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	desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
4. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

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recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
6. A wireless network system comprising:	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support

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a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4.

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	"We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an

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	earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in

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	which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route

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	in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is

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	desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the

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	interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165.

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	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining]

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	the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc

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	networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the

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	other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other

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	packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized

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	route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets

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	that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the

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	existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet."

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	Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these

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said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main

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sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if

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	one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23]

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	could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the

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	target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet."

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	Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160.

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	"[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be

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	shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-

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	known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily

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	broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson

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	and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet

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	should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the

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	packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

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updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in

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	promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the

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	next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these

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	optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4.

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	"[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the

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	target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153.

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	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum

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	allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3.

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	"As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in

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	which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D

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	through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches."

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	Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this

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	packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

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sends the optimized transmission path for each of the clients to the respective clients.	
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9.

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	"The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may

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	infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will

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	likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3

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	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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	"Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the

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	target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized

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	administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.

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	"[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167.

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	"Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3.

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	"When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is

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	received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the

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	packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route

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	cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in

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	its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then

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	sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this

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	host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the

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	next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's

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nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business

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node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the

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	route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165.

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	"[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere

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	in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in

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	which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this

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	host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this

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	packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be

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	shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to

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one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5.

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	"While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.

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22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.

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31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4.

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	"In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business

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	associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the

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	target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160.

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	"While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned,

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	or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4.

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	"Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be

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	small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach

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	C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
the first node process further comprises maintaining a second node link tree having second node link entries.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to

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	each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is

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	desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
32. A wireless system as recited in	"Mobile hosts should cache routes discovered in this way for use in sending future

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claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches."

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	Mobile Computing at 166-67.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile

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	Computing at 168.
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes

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	in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized

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	administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet

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	should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the

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	packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an

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	earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other

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	packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165.

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	"As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its

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	cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
maintaining a second node link tree having second node link entries at the first node.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other

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	mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the

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	existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet."

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	Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

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35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc

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	network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing

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	it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's

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	route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a

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	suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1.

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	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc

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	networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23]

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	could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original

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	sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of

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send the optimized transmission path for each of the plurality of client nodes to the respective client node.	use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4.

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	"Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be

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	small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to

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	also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson

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	1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving

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	sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route

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	discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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wherein the server process is configured to:	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	"[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1.

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transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson

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	at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9.

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	"[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option."

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	Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166.

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	"An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc

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	networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155.

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wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of

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selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	"Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be

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	small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to

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	also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc

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	network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then

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	sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166.

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	"An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11.

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	"A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4.

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	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D

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	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3

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	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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	"Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the

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	"Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3.

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	"When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is

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	received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the

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	packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route

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	cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in

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	its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then

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	sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its

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	cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

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8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other

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	packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in

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	promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore

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	future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information

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	from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
11. A method for providing wireless network communication comprising:	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support

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utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4.

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	"We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an

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	earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route

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	in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is

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	desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the

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	interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165.

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	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining]

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	the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

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wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3.

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plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and maintains a client link tree having client link entries representing each of the plurality of clients.	"As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference.

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packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson

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	1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks,

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	including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route

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	cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this

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	packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4.

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	"The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may

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	infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166.

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	"An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4.

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clients.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D

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	through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157.

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	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere

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	in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of

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	'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future

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	packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route

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	discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a

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	suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1.

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	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17.

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	"[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23]

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	could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original

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	sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of

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	use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4.

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	"Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be

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Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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	also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and maintains a client link tree having client link entries representing each of the plurality of clients.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc

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	networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
17. A method for providing wireless network communication comprising the steps of: a server process including a data	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract.

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packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the

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	routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1.

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	"[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its

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	cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other

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	mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the

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	existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet."

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	Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3.

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plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a

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	mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts

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	operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is

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	desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will

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link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded

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	in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to

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	another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the

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	route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be

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that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4.

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	"In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet,

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	reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be

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	also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks,

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	including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may

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	infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58.

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	"If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each

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first node through at least one of the remainder of said plurality of second nodes,	other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is

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	"Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc

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	it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts

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22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other

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second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be

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	shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of

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plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract.

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receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the

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	routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1.

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	"[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and

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	use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to,

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	e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its

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	cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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	packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network;	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1.

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performing node link tree housekeeping functions;	"[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson

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	at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9.

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	"[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option."

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	Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166.

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	"An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the

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	route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in

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	its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then

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	sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this

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	host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the

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	next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic;	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's

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deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business

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performing node link tree housekeeping functions,	associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the

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	in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular,

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	Mobile Computing at 166-67. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7.

Exhibit B5 – Invalidity Chart for Brownrigg Family based on the Dynamic Source Routing References

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the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business

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	associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5.

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	"We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the

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	"[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere

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	in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's

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	header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a

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	packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to

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	communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that

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	interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network

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	depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach

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	C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58.

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initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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remainder of said plurality of second nodes,	"[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in

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	Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4.

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	"[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the

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	target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153.

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	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum

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	allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as

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	a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be

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	shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record

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	from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to

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the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5.

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	"While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163.

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	"If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.

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35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.

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36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4.

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	"In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business

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	associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2.

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	or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc

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	network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing

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a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

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initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3.

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	"As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson

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	1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that

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	destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route

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	in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson

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	and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary

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	network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular,

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	when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches."

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	Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167.

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	"Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3.

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	"When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the

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	target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located

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	at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route

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	discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson

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	and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9.

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	infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere

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	in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of a client link tree. "A last optimization to improve the handling of errors is to support the caching of 'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Johnson and Maltz at 11. "A last optimization to improve the handling of errors is to support the caching of

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	'negative' information in a host's route cache. Suppose, in Figure 4, that none of these optimizations for handling errors are in use. When A receives B's route error packet, it may initiate a route discovery in order to find a new route to the same target. However, if hosts C, D, or E have an entry in their route cache for this target, they will likely reply to A from their cache with a cached copy of the same route that A just removed from its cache. If instead, A could enter into its cache when it receives B's route error packet, an indication that this hop is not currently working (rather than simply removing this hop from any routes currently in its cache), then A could ignore future replies from C, D, and E that include this hop from their caches." Mobile Computing at 168.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1.

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	"[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned

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	to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17.

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	"In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7.

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	"Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet,

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	reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing

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	it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply

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	is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3.

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through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and maintain a client link tree having client link entries representing each of the plurality of client nodes.	"As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has

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	earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract.

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said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the

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	routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1.

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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	use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to

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	accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178.

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	e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its

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	cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that

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said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1.

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	"[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination. The overhead of the protocol can be further reduced by making more extensive use of such caching. If a mobile host has cached a route listing some number of hops to a destination mobile host, then the shortest route to each of the hops listed on that route is naturally a prefix of that route. In this case, no new route discovery is needed for this mobile host to communicate with any of the other mobile hosts named as hops on any of the routes currently in its cache. Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissioins in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Johnson and Maltz at 7. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "If the target has an entry for this destination in its route cache, then it may send the

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	route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 5. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move sufficiently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Johnson and Maltz at 9. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Johnson and Maltz at 9. "The data in a host's route cache may be stored in any format, but the active routes in its cache in effect form a tree of routes, rooted at this host, to other hosts in the ad hoc network." Mobile Computing at 162.

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	"A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other

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	hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information

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	from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7.

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	"This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63. It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.
44. The server of claim 42, wherein the client link entries correspond to	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3.

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the server selected transmission path between the server and the respective client.	"[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each

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	"The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the

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45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1.

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radio modem,	"[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference. Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson

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	at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9.

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	"[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request

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	Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166.

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	"An improvement to this method of reflecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then

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	transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "[I]f the source and target mobile hosts are both within transmission range of each other, a simple ARP query is all that is needed to find a 'route' to the target host." Johnson 1994 at 3. "As the request propagates, each host adds its own address to a route being recorded in the packet, before broadcasting the request on to its neighbors." Johnson 1994 at 3. "When the query packet ultimately reaches the target host, the complete route from the original sender to this host will have been recorded in the packet. In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson 1994 at 4. "Mobile hosts should cache routes discovered in this way for use in sending future packets to that same destination." Johnson 1994 at 4. "Also, as a mobile host forwards packets, it will be able to observe many other routes to other mobile hosts, since each packet contains a route. By examing [sic, examining] the routes on packets that it forwards, a mobile host may be able to cache routes to new destinations or to obtain updated information to destinations already in its cache. Furthermore, since transmissions in a wireless network are necessarily broadcast transmissions, a mobile host may be able to learn new routing information from the route contained in any packet that it can receive, even if the packet is not explicitly addressed to this host." Johnson 1994 at 4.

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	"To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc

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	networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination

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	of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Mobile Computing at 157-58. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Mobile Computing at 159. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme, as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Mobile Computing at 157. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Mobile Computing at 155.

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	"Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Mobile Computing at 158. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Mobile Computing at 162-63.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any centralized administration or standard support services." Johnson 1994, Abstract. "Mobile hosts such as notebook computers, featuring powerful CPUs, large main memories, hundreds of megabytes of disk space, multimedia sound capabilities, and color displays, are now easily affordable and are becoming quite common in everyday business and personal life." Johnson 1994 at 1. "[E]mployees may find themselves together in a meeting room; friends or business associates may run into each other in an airport terminal; or a collection of computer science researchers may gather in a hotel ballroom for a workshop or conference.

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	Requiring each user to connect to a wide-area network in such situations, only to communicate with each other, may not be possible due to lack of facilities, or may be inconvenient or impractical due to the time or expense required for such connection." Johnson 1994 at 1. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson 1994 at 3 "In order for one host to communicate with another, it must initially discover a suitable route to use in sending packets to that destination. As long as conditions remain unchanged, this route should then continue to work for as long as it is needed. However, as the status of different links or routers used in this route change, changes in the route may be necessary, or a new route may need to be discovered" Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "We are also exploring additional areas related to ad hoc networking, such as the routing between an ad hoc network and wide-area network such as the Internet: if one or more of the mobile hosts in an ad hoc network are also connected to the Internet [8], it is possible for other mobile hosts in the ad hoc network to communicate with Internet hosts, but additional routing support is needed…" Johnson at 5. "[W]hen opening a TCP connection, separate packets are usually used to exchange SYN and ACK control bits between the two end hosts of the connection."); Johnson

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	1994 at 3 ("it must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 4. "In order to be of use to the original sender, though, the route must then be returned to the sender." Johnson at 4. "[I]t must initially discover a suitable route to use in sending packets to that destination." Johnson 1994 at 3. "Dynamic Source Routing in Ad Hoc Wireless Networks." Johnson and Maltz at 1. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Johnson and Maltz at 1. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Johnson and Maltz at 1. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Johnson and Maltz at 9. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Johnson and Maltz at 11 "We are also continuing to study other routing protocols for use in ad hoc networks,

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	including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Johnson and Maltz at 17. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Johnson and Maltz at 17. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet is delivered to the network layer software on that host." Johnson and Maltz at 4. "The route request thus propagates through the ad hoc network until it reaches the target host, which then replies to the initiator. The original route request packet is received only by those hosts within wireless transmission range of the initiating host, and each of these hosts propagates the request if it is not the target and if the request does not appear to this host to be redundant." Johnson and Maltz at 5. "We refer to the number of hops necessary for a packet to reach from any host located at one extreme edge of the network to another host located at the opposite extreme,

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	as the diameter of the network. For example, the diameter of the ad hoc network depicted in Figure 1 is two. We assume that the diameter of an ad hoc network will be small but may often be greater than one." Johnson and Maltz at 3. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Johnson and Maltz at 7. "This paper describes the design and performance of a routing protocol for ad hoc networks that instead uses dynamic source routing of packets between hosts that want to communicate. Source routing is a routing technique in which the sender of a packet determines the complete sequence of nodes through which to forward the packet; the sender explicitly lists this route in the packet's header, identifying each forwarding 'hop' by the address of the next node to which to transmit the packet on its way to the destination host." Johnson and Maltz at 2. "Each mobile host participating in the ad hoc network maintains a route cache in which it caches source routes that it has learned. When one host sends a packet to another host, the sender first checks its route cache for a source route to the destination. If a route is found, the sender uses this route to transmit the packet." Johnson and Maltz at 4. "Figure 2 shows an ad hoc network of five mobile hosts, in which mobile host A has earlier completed a route discovery for mobile host D and has cached the route to D through B and C. Since hosts B and C are on the route to JD, host A also learns the route to both of these hosts from its route discovery for D. If A later performs a route discovery and learns the route to E through B and C, it can represent this in its route

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	cache with the addition of the single new hop from C to E. If A then learns it can reach C in a single hop (without needing to go through B), A can use this new route to C to also shorten the routes to D and E in its route cache." Johnson and Maltz at 7. "Dynamic Source Routing in Ad Hoc Wireless Networks." Mobile Computing at 153. "An ad hoc network is a collection of wireless mobile hosts forming a temporary network without the aid of any established infrastructure or centralized administration." Mobile Computing at 153. "[A] class of students may need to interact during a lecture, friends or business associates may run into each other in an airport terminal and wish to share files, or a group of emergency rescue workers may need to be quickly deployed after an earthquake or flood." Mobile Computing at 154. "In order to return the route reply packet to the initiator of the route discovery, the target host must have a route to the initiator. If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169.

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	"We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "A host can add entries to its route cache any time it learns a new route. In particular, when a host forwards a data packet as an intermediate hop on the route in that packet, the forwarding host is able to observe the entire route in the packet." Mobile Computing at 163. "If the target has an entry for this destination in its route cache, then it may send the route reply packet using this route in the same way as is used in sending any other packet (Section 3.1). Otherwise, the target may reverse the route in the route record from the route request packet, and use this route to send the route reply packet." Mobile Computing at 160. "While two hosts are communicating with each other using cached routes, it is desirable for the hosts to begin using shorter routes if the hosts move suffciently closer together. In many cases, the basic route maintenance procedure is sufficient to accomplish this, since if one of the hosts moves enough to allow the route to be shortened, it will likely also move out of transmission range of the first hop on the existing route." Mobile Computing at 166. "An improvement to this method of refiecting shorter routes is possible if hosts operate their network interfaces in promiscuous receive mode. Suppose somewhere in the forwarding of a packet, mobile host B transmits a packet to C, with D being the next hop after C in the route in the packet, as illustrated in Figure 3. If D receives this

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	packet, it can examine the packet header to see that the packet reached it from B in one hop rather than two as intended by the route in the packet. In this case, D may infer that route may be shortened to exclude the intermediate hop through C. D then sends an unsolicited route reply packet to the original sender of the packet, informing it that it can now reach D in one hop from B. As with other route reply packets, other hosts which also receive this route reply (in particular, other hosts also operating in promiscuous receive mode) may also incorporate this change into their route caches." Mobile Computing at 166-67. "[S]mall data packets such as the initial SYN packet opening a TCP connection [23] could also easily be piggybacked, but we have not yet experimented with this option." Mobile Computing at 165. "[T]hey could also represent a number of cars with radio-equipped portables driving (very quickly) around an area of 1 square kilometer." Mobile Computing at 169. "We are also continuing to study other routing protocols for use in ad hoc networks, including those based on distance vector or link state routing, as well as the interconnection of an ad hoc network with a wide-area network such as the Internet, reachable by some but not all of the ad hoc network nodes." Mobile Computing at 178. "To send a packet to another host, the sender constructs a source route in the packet's header, giving the address of each host in the network through which the packet should be forwarded in order to reach the destination host. The sender then transmits the packet over its wireless network interface to the first hop identified in the source route. When a host receives a packet, if this host is not the final destination of the packet, it simply transmits the packet to the next hop identified in the source route in the packet's header. Once the packet reaches its final destination, the packet

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	is delivered to the network layer software on that host." Mobile Computing at 157-58. "If the host attempts to send additional data packets to this same host more frequently than this limit, the subsequent packets may be buffered until a route reply is received, but they do not initiate a new route discovery until the minimum allowable interval between new route discoveries for this target has been reached." Mobile Computing at 167. "Another option in the case of returning a route error packet is for this host to save the route error packet locally in a buffer, perform a route discovery for the original sender, and then send the route error packet using that route when it receives the route reply for this route discovery." Mobile Computing at 161. "As described in Section 3.2, when one host needs to send a packet to another, if the sender does not have a route cached to the destination host, it must initiate a separate route discovery, either buffering the original packet until the route reply is returned, or discarding it and relying on a higher-layer protocol to retransmit it if needed." Mobile Computing at 165. It would have been obvious for a node in the ad hoc network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
dynamically updating a second node link tree comprising second node link	It would have been obvious for a person of ordinary skill in the art to optimize the route cache stored in each node of ad hoc network of the Dynamic Source Routing

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entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	references in order to provide an efficient and reliable path to other nodes in the ad hoc network. Further, it would have been obvious for a node to provide the optimized route cache to other nodes so that other nodes, especially nodes joining the ad hoc network could quickly learn efficient source routes.

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The Perlman reference, U.S. Patent No. 5,323,394 (Perlman), includes descriptions relating to source routing and discovery of routes in a network.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The '516 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
received from said second network that are destined for said first network to said first network,	
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The '516 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The '516 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge

The '516 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network. It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said second node process of each of said second nodes includes selecting a radio transmission path to	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a

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The '314 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an

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The '314 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
4. A first node providing a gateway	"The invention features methods and apparatus for determining a route from a source

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between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route

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from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	to the source end system." Perlman at 6:6-10.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.

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The '314 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6,

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	entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
implementing a process requesting updated radio transmission path data from said server node, and in	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed

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response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

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The '314 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
that are destined for said first network to said first network,	
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated

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a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

Invalidity Chart for U.S. Patent No. 8,233,471

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients,	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the

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determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.

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4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated

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maintaining a send/receive data buffer in digital memory, and	with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from

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	LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.

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wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to:	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN

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compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. A method for providing wireless network communication comprising: providing a server implementing a	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52.

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server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is

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	Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data,

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	such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
11. A method as recited in claim 10,	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number

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wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
14. A method for providing wireless	"The invention features methods and apparatus for determining a route from a source

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network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X

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	Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in

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	the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic;	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management

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	techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service

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	Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the

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packet transmission from the first node is optimized.	source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled

Exhibit B6 – Invalidity Chart for Brownrigg Family based on U.S. Patent No. 5,323,394 (Perlman)

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the

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to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a

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	sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
the first node process further	"Eventually, multiple copies of the explorer packet reach the destination end system,

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comprises maintaining a second node link tree having second node link entries.	and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge

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send/receive data buffer in digital memory, and	then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9

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	either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described

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	above." Perlman 5:53-12.
maintaining a second node link tree having second node link entries at the first node.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
36. A method as recited in claim 34, wherein said first node process	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time."

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	Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
41. The server node of claim 40, wherein the server process is further configured to perform gateway	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and

The '471 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
functions.	appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an

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	explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

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wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5.

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	"While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
4. A wireless network system as recited in claim 2, wherein said server	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN

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a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has

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	address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which

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	passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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each of the clients to the respective clients.	
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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insert said client in said client link tree if said client is authentic and is not already in said client link tree.	
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated

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	in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a

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	sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein the server process:	"Eventually, multiple copies of the explorer packet reach the destination end system,

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receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
maintains a client link tree having client link entries representing each of the plurality of clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN

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network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has

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	address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which

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	passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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each of the clients to the respective clients.	
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated

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	in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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clients; and	
maintains a client link tree having client link entries representing each of the plurality of clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.

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	It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled

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	'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the

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plurality of clients, and	destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time.

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said comparison meets predetermined conditions.	However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route

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	to the source end system." Perlman at 6:6-10.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said second node process of each of said second nodes includes	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address

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initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to

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	locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

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selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a

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	LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets

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housekeeping functions;	244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route

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	to the source end system." Perlman at 6:6-10.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic;	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time."

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	Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio;	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number

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maintaining a send/receive data buffer in a digital memory; and	refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end

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	system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination

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	end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.

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	It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled

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	'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52.

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implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

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34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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second nodes is authentic and is not already in said client link tree.	
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
maintaining a second node link tree comprising second node link entries	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found,

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representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

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initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5.

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	"While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission;	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN

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implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has

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	address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which

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	passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time."

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	Perlman at 14:41-58.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets

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server node controller implementing a server process, said server process configured to:	244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route

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server selected transmission path for each of the plurality of client nodes to the respective client node; and	to the source end system." Perlman at 6:6-10.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port

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packets via said client radio modem,	listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then,

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	the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	to the source end system." Perlman at 6:6-10.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time. However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
wherein said second node process of each of said second nodes includes	"Ordinarily, to send a message from a transmitting end system to a receiving end system on the same LAN, a header is attached to the message indicating the address

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	of the source end system and the destination end system. Thus, for example, a message transmitted from a source end system having an address X to a destination end system having an address Y has a header: Y|X Each end system on the LAN, upon receiving this message, determines if its address is Y, and if so, the end system reads the message. To send a message from a transmitting end system on a first LAN to a receiving end system on a second LAN, the sequence of LAN numbers that should be traversed to reach the second LAN is appended to the message. For example, if end system 100 has address X, and end system 102 has address Y, a message to be transmitted from end system to end system 102 would contain a header with the sequence: Y|X|L5|L3|L9 or, alternatively, the message might contain the sequence: Y|X|L5|L3|L9 either of which indicates a path from end system 102 to end system 100 (i.e., from LAN L5 to LAN L7 or LAN L3, and then to LAN L9). Schemes which use this technique are known as 'source routing bridging' schemes, and the messages containing such a sequence are known as 'source routed' messages. (Further detail on one source routing bridging scheme can be found in IEEE Proposed Standard 802.5M/D6, entitled 'Source Routing Transparent Bridge Operation', available from the IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, N.J. 08855-1331, and incorporated herein by reference.)" Perlman at 3:33-4:5. "While the above describes the typical mechanism for routing packets in a LAN/bridge network, it does not explain how the routes are determined. This is typically accomplished by means of 'explorer' messages. When an end system seeks to

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	locate a route to another end system which is not on the same LAN, it originates an explorer message indicating the address of the desired destination, and then transmits the explorer message on the LAN. Through a procedure described below, copies of the explorer message are propagated through all of the bridges and LANs in the network, exploring every possible route through the network and collecting information about the paths followed. The explorers may also accumulate other data, such as the maximum packet size along the path followed or the 'cost' (expediency) of those paths. Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system. Once the acknowledgement is received by the source end system, communications can begin using the source routing scheme described above." Perlman 5:53-12.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"The invention features methods and apparatus for determining a route from a source end system to a destination end system through a network comprised of LANs and bridges connecting the LANs." Perlman at 1:49-52. "FIG. 5F illustrates the procedure by which the root bridge deals with LAN number refresh messages from other designated bridges. After receiving 240 the refresh message, the root bridge determines 242 whether its database associates the LAN number listed in the refresh message (field 284, FIG. 6C) with the bridge and port listed in the refresh message (fields 280 and 282, FIG. 6C). If so, the root bridge resets 244 the refresh time in the corresponding entry to the current time.

The '496 Patent – Claims	U.S. Patent No. 5,323,394 (Perlman)
	However, if the refresh message and the database do not correspond, the root bridge then determines 246 whether the LAN number in the refresh message is associated with another bridge and port. If not, the root bridge updates its database by associating the bridge and port listed in the message with the LAN number indicated in the message, and then resets 244 the refresh time in the entry to the current time." Perlman at 14:41-58. It would have been obvious to implement the route discovery and management techniques of Perlman in a wireless network having the controller and modem features claimed, including the destination acting as a gateway to the internet and translating packets between the internet and wireless network.
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"Eventually, multiple copies of the explorer packet reach the destination end system, and the destination end system is able to compare the various paths that were found, and choose the most expedient route (e.g., by selecting the route which passed through the least number of LANs, or the route with the lowest 'cost'). Then, the destination end system stores this route for use in future communications with the source end system, and transmits an acknowledgement message containing the route to the source end system." Perlman at 6:6-10.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The Network 3000 system, including the Network 3000 Server Configuration Manual (June 1992), relates to hierarchical routing in a network.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Network 3000
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with

The '516 Patent – Claims	Network 3000
received from said second network that are destined for said first network to said first network,	the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

The '516 Patent – Claims	Network 3000
	Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '516 Patent – Claims	Network 3000
the least amount of traffic, and the path to the gateway through the fastest clients.	optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2: wherein the digital controller receives	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in

The '516 Patent – Claims	Network 3000
data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links."

The '516 Patent – Claims	Network 3000
network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '516 Patent – Claims	Network 3000
	"The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in

The '516 Patent – Claims	Network 3000
clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5.

The '516 Patent – Claims	Network 3000
the server can be through one or more other clients of the first network.	"The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	Network 3000
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed

The '314 Patent – Claims	Network 3000
	periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

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wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said selected path to said	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

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first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately

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second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in

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	a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic,	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the

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and the path to the first node through the fastest second nodes.	manner claimed so as to develop an accurate assessment of network conditions.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence

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	of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

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selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

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implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It

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The '314 Patent – Claims	Network 3000
radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1.

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	"Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein said digital controller	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

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changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at

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	§ 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
a controller implementing a process	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

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to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.

Invalidity Chart for U.S. Patent No. 8,233,471

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2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed

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	periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
6. A wireless network system comprising:	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message

The '471 Patent – Claims	Network 3000
	switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
remainder of said plurality of clients,	"Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
plurality of clients, and	acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.

The '471 Patent – Claims	Network 3000
client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

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The '471 Patent – Claims	Network 3000
providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully

The '471 Patent – Claims	Network 3000
	received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node."

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The '471 Patent – Claims	Network 3000
	Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.

The '471 Patent – Claims	Network 3000
sends the optimized transmission path for each of the clients to the respective clients.	To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

The '471 Patent – Claims	Network 3000
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

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The '471 Patent – Claims	Network 3000
	"The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
a link selection step that is one of a direct link to a server and an indirect	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail

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The '471 Patent – Claims	Network 3000
link to said server through at least one of the remainder of said plurality of clients,	recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further comprises the step of maintaining a client link tree having client link	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The

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The '471 Patent – Claims	Network 3000
entries corresponding to an optimized transmission path for each of the plurality of clients, and	TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
15. A method as recited in claim 14, wherein said server process further	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.

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The '471 Patent – Claims	Network 3000
comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message

The '471 Patent – Claims	Network 3000
node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6.

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	"The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore

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The '471 Patent – Claims	Network 3000
	the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in

The '471 Patent – Claims	Network 3000
	the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic;	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages.

The '471 Patent – Claims	Network 3000
	Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to

The '471 Patent – Claims	Network 3000
	serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2.

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	"Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.

The '471 Patent – Claims	Network 3000
second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	
22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
	"The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a link to said first node that is one of a direct link to said first node	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail

The '471 Patent – Claims	Network 3000
and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
the first node process further comprises maintaining a second node link tree having second node link	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The

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entries.	TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic;	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

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logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are

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memory, and	adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network

The '471 Patent – Claims	Network 3000
	hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2.

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	"Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
maintaining a second node link tree having second node link entries at the first node.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
35. A method as recited in claim 34, wherein said first node process further includes:	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.

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comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no

The '471 Patent – Claims	Network 3000
receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

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	"Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '471 Patent – Claims	Network 3000
other client node;	"The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
41. The server node of claim 40,	It would have been obvious for the node associated with the master computer to

The '471 Patent – Claims	Network 3000
wherein the server process is further configured to perform gateway functions.	serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	Network 3000
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed

The '496 Patent – Claims	Network 3000
	periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein the server process is	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

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configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

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a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1.

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	"Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1.

The '496 Patent – Claims	Network 3000
	"Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to

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from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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not already in said client link tree.	
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

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plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully

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	received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node."

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	Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.

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receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
9. A wireless network system as	It would have been obvious to implement authentication of clients and maintenance

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recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	of the network map, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.

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11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed

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	periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

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selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein the server process:	"The Time Synchronization/Node Routing Table (TS/NRT) combined message

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receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.

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12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

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	"The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said server that is one of a direct link to	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail

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said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further includes maintaining a client link tree having client link entries representing	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The

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each of the plurality of clients, and wherein the server process:	TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
13. A method as recited in claim 12, wherein said server process further	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.

The '496 Patent – Claims	Network 3000
includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5.

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	"The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages.

The '496 Patent – Claims	Network 3000
	Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server,

The '496 Patent – Claims	Network 3000
	e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	"Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
maintains a client link tree having client link entries representing each of the plurality of clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to

The '496 Patent – Claims	Network 3000
	level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references

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	disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with

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	the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

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provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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link tree if said client is authentic and is not already in said client link tree.	
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links."

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process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6.

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	"The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous

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	local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.

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	To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server,

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	e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2.

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	"Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	"Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues

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The '496 Patent – Claims	Network 3000
	in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in

The '496 Patent – Claims	Network 3000
	the running system." Network 3000 at § 4.5.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol

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The '496 Patent – Claims	Network 3000
	Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references

The '496 Patent – Claims	Network 3000
	disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has

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	occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence

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	of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.

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selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

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33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at

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	§ 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
initiating a radio transmission path to	"In addition to receiving the TS/NRT message from the Master node, a Slave node will

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a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
the first node comprising: a first node controller; and a first	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first

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node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message

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	switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to

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	level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	It would have been obvious to compares links in a client link tree to links made available during operation and update the client link tree accordingly.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol

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maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

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	"Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully

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	received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node."

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	Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
maintaining a send/receive data buffer in digital memory, and	is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1.

The '496 Patent – Claims	Network 3000
	"Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1.

The '496 Patent – Claims	Network 3000
	"Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
38. A method as recited in claim 37,	It would have been obvious to compares links in a client link tree to links made

The '496 Patent – Claims	Network 3000
wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	available during operation and update the client link tree accordingly.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

The '496 Patent – Claims	Network 3000
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.

The '496 Patent – Claims	Network 3000
	"The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
receive information identifying selected transmission paths from each	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the

The '496 Patent – Claims	Network 3000
of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	manner claimed so as to develop an accurate assessment of network conditions.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no

The '496 Patent – Claims	Network 3000
said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	"Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
remainder of said plurality of clients,	mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem, receiving and transmitting of data	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message

The '496 Patent – Claims	Network 3000
packets via said server radio modem,	switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6.

The '496 Patent – Claims	Network 3000
	"The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program.

The '496 Patent – Claims	Network 3000
	The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references

The '496 Patent – Claims	Network 3000
	disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"In addition to receiving the TS/NRT message from the Master node, a Slave node will request a TS/NRT message following an initial download, or after a power-fail recovery" Network 3000 at § 4.5. "Each slave then uses the procedure described below to construct its NRT which it then passes to each of its slaves. Both the NRT global address field and UP/DOWN mask starts off as zero (i.e. the network master's global address and UP/DOWN mask are by definition zero). As the NRT is distributed each node determines its global address and UP/DOWN mask and fills in the appropriate field in the NRT. Therefore the global .address of a node is the concatenation of the local addresses of all previous local masters that the NRT has travelled to from the network master to that node." Network 3000 at § 4.5.1. "Global data messages are those which must pass through at least one master before reaching their destination." Network 3000 at § 3.2. "Local messages are those which do not have to pass through any nodes to reach their destination." Network 3000 at § 3.2. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000. Peer to Peer uses the Master and Slave modules which should not be confused with

The '496 Patent – Claims	Network 3000
	the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"BSAP supports a simple tree topology. As a matter of terminology, the network master computer is defined as the root of the tree. Emanating from the root is the first level of node(s) or branch. From the first level there may be a second level; and from the second a third; and so forth up to a maximum of six levels. There is no requirement for symmetry within the tree structure." Network 3000 at § 2.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Any given node within the network (except the extremities) serves a dual purpose. It is master to the node(s) immediately below it and slave to the node immediately above it. These two relationships are defined as local because the nodes involved are adjacent to each other. Messages between a master and slave (with no intervening nodes) are defined as local messages. Messages which must pass through one or more intervening nodes to reach their destination are defined as global messages. Figure 1 illustrates a simple network and the global and local relationships between its nodes. To assist you in developing your particular network configuration, Bristol Babcock has a program called NETTOP available." Network 3000 at § 2.3. "Peer to Peer is a mechanism for data transfer between nodes on the Network-3000.

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	Peer to Peer uses the Master and Slave modules which should not be confused with the BSAP Master/Slave communication scheme. Peer to Peer allows any node to be a Peer to Peer Master and/or Slave. The determining factor is the presence or absence of the Peer to Peer Master and Slave ACCOL module(s}. A Master module is executed periodically at the request of the ACCOL task in which it is present." Network 3000 at § 4.2. "The asynchronous protocol presented here is appropriate for transparent message switching applications utilizing hard wire, telephone, and radio communication links." Network 3000 at § A.3. "Buffering failures occur when a node does not have sufficient space to accept a data message." Network 3000 at § 2.6. "The UP-ACK message is used by the master to inform the slave that it successfully received and buffered the message." Network 3000 at § 3.1. "Therefore, alarms from the local master and/or one or more slaves may be placed in a single communication buffer for transmission to the next level of the network hierarchy." Network 3000 at § 4.1. It would have been obvious for the node associated with the master computer to serve as a gateway to, e.g., the internet, so that the node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B7 – Invalidity Chart for Brownrigg Family based on Network 3000

The '496 Patent – Claims	Network 3000
	Further, to the extent not inherent, it would have been obvious to use data buffers in the manner claimed in such a system.
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"The Time Synchronization/Node Routing Table (TS/NRT) combined message enables each node in a Network 3000 configuration to know what the topology of the network is, the node's unique global address and the current date and time. The TS/NRT emanates from the Network Master Device and 'trickles' down from level to level until each node on the network has received it. There is NO application level acknowledgement to the TS/NRT message." Network 3000 at § 4.5. "The NRT is created at the Network Master Device using the NETTOP utility program. The NRT may be modified at any time when a network configuration change has occurred. Once the NRT has been altered the new NRT is distributed to all nodes in the running system." Network 3000 at § 4.5. To the extent not inherent, it would have been obvious to a person of ordinary skill to optimize the NRT based on the packets received from the downstream nodes in the manner claimed so as to develop an accurate assessment of network conditions.

Exhibit B8 – Invalidity Chart for Brownrigg Family based on Layer Net

The Layer Net reference, Bhatnagar, A. and Robertson, T., "Layer Net: A New Self-Organizing Network Protocol," MILCOM 90, 1990 IEEE Military Comm. Conf. 845 (Sept.-Oct. 1990) (Layer Net), includes descriptions relating to routing in a self-organizing network.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Layer Net Reference
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is

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second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the

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the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum

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	disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-

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	known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable

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transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring

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and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then

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	search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846.

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	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving

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	them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.

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from the second network is received from the TCP/IP protocol network.	
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845.

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transmission paths to optimize the data packet transmission paths of the clients.	"All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.

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Invalidity Chart for U.S. Patent No. 8,000,314

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1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846.

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	"In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

The '314 Patent – Claims	Layer Net Reference
	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes selecting a radio transmission path to	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a

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said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

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	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at

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wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the

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	network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in

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	the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is

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	rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its

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	neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845.

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communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor.

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	Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each

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	other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to

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	provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner.

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process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or

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	node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree

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	by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules

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	them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.

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2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846.

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	"In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

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	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a

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that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

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	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network."

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	Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages

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	during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is

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	realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner.

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	Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is

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	realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or

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	node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of

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	available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by

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	appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845.

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data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and

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	interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network."

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	Layer Net at 846-47.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then

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	search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate

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	the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules

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	them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted

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client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer

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	Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages

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	during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further comprises the step of maintaining a client link tree having client link	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845.

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entries corresponding to an optimized transmission path for each of the plurality of clients, and	"All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
wherein the server process: receives the selected transmission	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer

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path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two

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	disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.

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15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of

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	available slots." Layer Net at 849.
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845.

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implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its

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	neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled

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	operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises:	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then

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logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises:	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845.

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send/receive data buffer in a digital memory, and	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the

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malfunctioning nodes.	network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then

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nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
22. A wireless system as recited in claim 21, wherein the first node process further includes:	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is

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receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

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	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
the first node process further comprises maintaining a second node link tree having second node link entries.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845.

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	"All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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predetermined conditions.	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using

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	a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each

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	other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846.

The '471 Patent – Claims	Layer Net Reference
	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
maintaining a second node link tree having second node link entries at the first node.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all

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	nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

Exhibit B8 – Invalidity Chart for Brownrigg Family based on Layer Net

The '471 Patent – Claims	Layer Net Reference
	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846.

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	"In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

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	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845.

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server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by

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	communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
41. The server node of claim 40, wherein the server process is further	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in

The '471 Patent – Claims	Layer Net Reference
configured to perform gateway functions.	the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B8 – Invalidity Chart for Brownrigg Family based on Layer Net

Invalidity Chart for U.S. Patent No. 8,625,496

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1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846.

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	"In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

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	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a

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that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients; and	suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

The '496 Patent – Claims	Layer Net Reference
	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

The '496 Patent – Claims	Layer Net Reference
	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at

The '496 Patent – Claims	Layer Net Reference
modem,	845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the

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	network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in

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	the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network

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selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	(which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by

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	appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or

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	node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845.

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	"In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two

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	disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways,

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	including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving

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	them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of

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	available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by

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	appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845.

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transmission path between the server and the respective client.	"All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
11. A method for providing wireless	"A self-organizing multi-hop radio network is capable of creating its own topology

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network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root

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	measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to

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	be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
maintains a client link tree having client link entries representing each of the plurality of clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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12. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner.

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	Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is

Exhibit B8 – Invalidity Chart for Brownrigg Family based on Layer Net

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	realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
receives information identifying the	"Since all nodes acquire complete global topological information, they can form

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selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages.

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	This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.

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13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

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	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846.

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	"When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to

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	be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted

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client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer

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	Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages

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	during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node

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from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

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	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
maintains a client link tree having client link entries representing each of the plurality of clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its

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17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845.

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	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its

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	neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving

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each of the clients to the respective clients.	them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum

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	disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node

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	to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn

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	the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by

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	communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for

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	communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled

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	operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn

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	the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by

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	communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring

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	transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then

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	search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846.

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maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of

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	available slots." Layer Net at 849.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages

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	during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
27. In a wireless system comprising a plurality of second nodes and a first	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at

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node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting

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	from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by

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	appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its

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	neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled

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	operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845.

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	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network.

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	When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a

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modem, receiving and transmitting data packets via said second node radio modem, and	single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective

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	schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for

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	communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner.

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	Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is

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	realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the

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	tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by

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	communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is

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	rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to

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	identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that

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second node radio modem,	all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2

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	nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its

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	neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846.

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	"In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link.

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	When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a

Exhibit B8 – Invalidity Chart for Brownrigg Family based on Layer Net

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said first node through at least one of the remainder of said plurality of second nodes; and	suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.

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38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages

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	during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising:	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845.

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a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting

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	pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new

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	node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all

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server selected transmission path for each of the plurality of client nodes to the respective client node; and	nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network

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	(which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is

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	present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846.

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	"Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the

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	number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845.

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includes the controlling of said server radio modem, receiving and transmitting of data packets via said server radio modem,	"The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and

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	interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a client link tree having client link entries representing each of the plurality of clients, and	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all

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	nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846.

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	"If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for

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	communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846. "When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving

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	them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages.

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	When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner.

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	Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or

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	node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849.

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	"Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and	"A self-organizing multi-hop radio network is capable of creating its own topology and transmission schedules dynamically and in a distributed manner." Layer Net at 845. "The self-organizing network is assumed to consist of nodes placed in such a way that all pairs of nodes are not directly connectable, but all nodes can be organized into a

The '496 Patent – Claims	Layer Net Reference
transmitting data packets via said first node radio modem, and	single multihop network." Layer Net at 845. "The network is comprised of links, where a link is defined as a permitted communication channel between nodes in range of each other. A 'starter node' is present that initiates the tree formation phase and coordinates other network organization procedures until the network starts functioning in a scheduled manner. Any node can serve as the starter node." Layer Net at 845. "During normal scheduled operation, a node tunes itself to listen to or transmit using a specific receiver directed code in each time slot in the schedule so that neighboring transmissions do not affect its operation. To prevent overlapping of transmissions, a suitable procedure should be followed for communication in each slot." Layer Net at 845. "In the initial 'network building' phase a starter node starts a broadcast that is rebroadcast by all nodes that hear it. As the broadcast propagates all the nodes learn the identity and location of all their neighbors. The connectivity information that is obtained during this broadcast is used by the starter node to organize a tree network. Links are then added to this initial tree to form a highly connected network." Layer Net at 846. "In the next 'scheduling' phase these links are scheduled in a distributed manner. Each node is assigned a layer number which is equal to its distance from the root measured in hops along the network. Schedules are made one layer at a time, starting from the starter node (layer 0). This nodes sets up a schedule for itself and transmits it to its one-hop neighbors (layer 1). These nodes then mark their own schedules and interact to resolve conflicts, if any. Scheduling information is then sent to the layer 2 nodes and the process continues until all nodes have formed their respective

The '496 Patent – Claims	Layer Net Reference
	schedules. At the end of this phase all links are scheduled to be activated once in the entire frame or slots. The efficiency of the schedule can be enhanced by permitting pairs of nodes to communicate in any free slots that may be available to them." Layer Net at 846. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for

The '496 Patent – Claims	Layer Net Reference
	communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. "Erroneous reception of data should also be reported to the node that sent the packet so that, the lost packet can be retransmitted." Layer Net at 846. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"Since all nodes acquire complete global topological information, they can form routing tables for sending data packets on efficient routes to all other nodes." Layer Net at 845. "All peripheral nodes transmit 'return messages' back to the starter node along the tree. A node waits for a return message from all its children before transmitting, and its own return message contains all information about the tree below it and its neighbors. Thus, when all the nl nodes have transmitted to the starter node, this node has the configuration of the asynchroronous tree network and the locations of all nodes in the network." Layer Net at 846.

The '496 Patent – Claims	Layer Net Reference
	"When the starter node has received complete information about the tree network (which includes information about node locations and physical neighbors of all nodes), this entire map is then transmitted down the tree to all the nodes, thus giving them complete global information." Layer Net at 846. "If the distance from a node to any of its physical neighbors measured along the tree by the map is greater than two hops, a link is added connecting it to that neighbor. Using this rule any node can produce a new complete map of the entire network." Layer Net at 846-47. "Changes in topology can result in an old link (or node) going down or a new link (or node,) coming up during the operation of the network. When a link goes down the previously connected nodes can no longer hear each other. This may occur if the nodes are moving away from each other. The nodes then search their routing tables for alternate paths to route their data packets and register the fact that the link no longer exists. This is also reported to other nodes in the network by appending this information with all data packets and negation messages. This information will be allowed to percolate throughout the network. The two disconnected nodes then listen to transmissions occurring during their free slots to identify their new neighbors (if any) and form one or more new links by communicating with those neighbors. Since we are following the "minimum disturbance criterion", new links are formed only when old links are broken. This formation of new links is reported to other nodes during the course of scheduled operation in a manner similar to the reporting of a broken link. When a node goes down all its links are broken and no new links romp up. This is realized by its previous neighbors since all previous links to that node are reported to

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	be broken. These nodes their report the disappearance of this node to other nodes by appending this information with their data packets or negation messages. When a new node comes up in the network, it listens to the transmissions of its neighbors to determine its connectivity and the slots available to it for communication. After this it forms links with some of its neighbors and schedules them in a conflict-free manner. This formation of links and the coming up of a new node are then reported to other nodes along with data packets or negation messages during scheduled operation. Note that once a scheduled network is formed, the number of additional nodes that can connect to it is limited by the number of available slots." Layer Net at 849. It would have been obvious to a person of ordinary skill in the art for the starter node to optimize the map transmitted down the tree in the manner claimed in order to provide an optimal starting point for the network. For example, such would eliminate the need for the downstream nodes to compute the optimal connectivity for initial network configuration, eliminating redundant processing.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
	of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2: wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
data packet with said header; and	
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
	NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
13. A method as recited in claim 10 further comprising maintaining a map	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435.

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . .

The '516 Patent – Claims	Garcia-Lunes-Aceves Reference
	Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table,

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
of said plurality of second nodes; and	that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
	its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
	of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
10. A client node in a network including a server node having a server radio modem and a server controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435.

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
	of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435.

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
	"Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
12. A first node providing a gateway	"In a multihop PRNET, the nodes of the network are not all within one another's line

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table

The '314 Patent – Claims	Garcia-Lunes-Aceves Reference
transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and

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	its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
14. A first node providing a gateway between a wireless network and a second network, the first node	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to

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comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table,

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that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

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	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

Invalidity Chart for U.S. Patent No. 8,233,471

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2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network."

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wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the

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	ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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authentic.	
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
	source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further comprises maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.

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	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing

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	table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436.

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	"Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	
10. A method for providing wireless network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435.

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server through at least one of the remainder of said plurality of clients,	"Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3."

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	Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . .

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	Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
12. A method as recited in claim 11, wherein said server process further	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing

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	table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436.

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	"Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	"Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said first node process	"Each node in the PRNET maintains three tables: a routing table, a distance table, and

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dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436.

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	"If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and

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memory, and	appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and

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	its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

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	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the

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nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor

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	when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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the first node process further comprises maintaining a second node link tree having second node link entries.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436.

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	"If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
33. A wireless system as recited in claim 32, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic;	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in

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memory, and	the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After

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	transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
maintaining a second node link tree having second node link entries at the first node.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434.

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes to the respective client node.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

The '471 Patent – Claims	Garcia-Lunes-Aceves Reference
	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients;	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
and	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network."

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the

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	ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source

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server through at least one the remainder of said plurality of clients,	routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table

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The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

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	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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not already in said client link tree.	
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436.

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	"Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network

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	interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436.

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	"Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is

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send information identifying the server selected transmission path for each of the clients to the respective clients.	included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

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comparison meets predetermined conditions.	
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	"Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
11. A method for providing wireless	"In a multihop PRNET, the nodes of the network are not all within one another's line

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The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients, wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435.

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plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and maintains a client link tree having client link entries representing each of the plurality of clients.	"Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
12. A method for providing wireless	"In a multihop PRNET, the nodes of the network are not all within one another's line

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network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients, wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process: receives information identifying the	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435.

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selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
13. A method as recited in claim 12,	"If Node i changes one or more entries in its distance table at the end of Procedure 1

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table,

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	that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
plurality of clients,	routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients,	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table

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determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and maintains a client link tree having client link entries representing each of the plurality of clients.	defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

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	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
17. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data

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remainder of said plurality of clients,	packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said server process further comprises the step of maintaining a client link tree having client link	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435.

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entries representing each of the plurality of clients, and wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	"Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3."

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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	Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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link tree if said client is authentic and is not already in said client link tree.	
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436.

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	"Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways,

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node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

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	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After

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	transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

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conditions.	
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434.

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	"An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436.

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	"First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node."

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

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housekeeping functions;	Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
25. The first node of claim 24, wherein the first node process further	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3."

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includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison meets predetermined conditions.	Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.

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tree if said second node is authentic and is not already in said client link tree.	
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network."

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	Garcia-Luna-Aceves at 435.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any

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	NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436.

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	"If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

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initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

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the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
34. A wireless network system as	"If Node i changes one or more entries in its distance table at the end of Procedure 1

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recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
36. In a wireless network system	"In a multihop PRNET, the nodes of the network are not all within one another's line

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comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434.

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transmitting data packets via said second node radio modem,	"In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . .

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	Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g.,

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buffer in digital memory, and	the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . .

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	Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435.
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to	"If Node i changes one or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	It would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	"In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node; determine a server selected transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
each of the plurality of client nodes to the respective client node; and maintain a client link tree having client link entries representing each of the plurality of client nodes.	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways,

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
remainder of said plurality of clients,	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
radio modem, receiving and transmitting of data packets via said server radio modem,	"In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
maintaining a client link tree having client link entries representing each of the plurality of clients, and receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table,

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	"After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434. "In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the	"A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
remainder of said plurality of second nodes,	routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436. "In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every t_N seconds. After transmitting its last $NAND_i$, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node	"In a multihop PRNET, the nodes of the network are not all within one another's line of sight. Accordingly, packets may have to be forwarded through various nodes before they reach their destinations and each node must maintain a routing table to support packet forwarding." Garcia-Luna-Aceves at 434.

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	"In a single-channel multihop PRNET a node can receive only one collision-free packet at a time from the radio channel." Garcia-Luna-Aceves at 434. "An update message is sent out periodically (but asynchronously) by each node." Garcia-Luna-Aceves at 435. It would have been obvious for a node in the network to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	"Each node in the PRNET maintains three tables: a routing table, a distance table, and a good-neighbor table." Garcia-Luna-Aceves at 435. "Note that the information about immediate ancestors stored in the routing table defines a minimum-weight spanning tree, rooted at the node storing the routing table, that specifies the shortest path from the node to every other node in the network." Garcia-Luna-Aceves at 435. "A node determines the establishment of radio connectivity with a new neighbor when it receives a NAND from that neighbor." Garcia-Luna-Aceves at 435. "Because each node maintains a source tree in its routing table, routing of data packets can be accomplished in three ways: (1) incremental routing, (2) source routing, and (3) broadcast or multicast routing." Garcia-Luna-Aceves at 436.

Exhibit B9 – Invalidity Chart for Brownrigg Family based on Garcia-Luna-Aceves

The '496 Patent – Claims	Garcia-Lunes-Aceves Reference
	"In source routing, the source node specifies the NIDs of all the nodes in the path from source to destination based on the information stored in its source tree; that path is included in the header of the data packet." Garcia-Luna-Aceves at 436. "First, when a node is turned on, it initializes its routing and distance tables by means of Procedure 0. . . . Using Procedure 1, each node sends a NAND to its neighbor every tN seconds. After transmitting its last NANDi, Node i . . . awaits the reception of NANDs from itself and its neighbors." Garcia-Luna-Aceves at 436. "Node i uses Procedure 1 to update its distance table upon the reception of any NAND." Garcia-Luna-Aceves at 436. "If Node i changes on or more entries in its distance table at the end of Procedure 1 and/or Procedure 2, it proceeds to update its routing table using Procedure 3." Garcia-Luna-Aceves at 437. "After computing the shortest distance to Node j, Node i makes certain that (1) the ancestor or next node to a destination is reachable, and (2) all the paths in the routing table contain only nodes known to be reachable." Garcia-Luna-Aceves at 437.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The patent owner made a number of admissions during prosecution of the applications in, and proceedings regarding, the Brownrigg patent family.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Admitted Prior Art/Estoppel
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '516 Patent – Claims	Admitted Prior Art/Estoppel
network, and passing data packets received from said second network that are destined for said first network to said first network,	
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78. .
wherein said digital controller changes the transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '516 Patent – Claims	Admitted Prior Art/Estoppel
the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
5. A server as recited in claim 2:	It would have been obvious for a node in the network to serve as a gateway to, e.g.,

The '516 Patent – Claims	Admitted Prior Art/Estoppel
wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting said data packet to a proper format for said second network, and sending	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the

The '516 Patent – Claims	Admitted Prior Art/Estoppel
said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978). It also would have been obvious to include a packet type to packets received by the gateway in order to provide separate processing of different kinds of packets. Such could ensure adequate quality of service for the data packet and more reliable handling of data packets of different types, which were well-known to a person of ordinary skill.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '516 Patent – Claims	Admitted Prior Art/Estoppel
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	Nodes having a gateway functions to a point-to-point network, such as the internet, would inherently involve the TCP/IP protocol. At a minimum, it would have been obvious to use TCP/IP in a point-to-point protocol network in order to provide a well-known and reliable protocol. See V. G. Cerf and R. E. Kahn, "A protocol for packet network intercommunications," IEEE Trans. Commun., vol. COM-22, pp. 637-648 (May 1974); V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '516 Patent – Claims	Admitted Prior Art/Estoppel
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

Invalidity Chart for U.S. Patent No. 8,000,314

The '314 Patent – Claims	Admitted Prior Art/Estoppel
1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

The '314 Patent – Claims	Admitted Prior Art/Estoppel
of said plurality of second nodes; and	
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

The '314 Patent – Claims	Admitted Prior Art/Estoppel
configured to receive the data packet from said second network, a second converter configured to convert the data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
10. A client node in a network including a server node having a server radio modem and a server	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '314 Patent – Claims	Admitted Prior Art/Estoppel
controller which implements a server process that includes controlling the server node to receive and transmit data packets via said server node to other nodes in the network, the client node comprising: a client node radio modem; and a client node controller; said client node controller implementing a process including receiving and transmitting data packets via said client modem;	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
selecting a radio transmission path to said server node that is one of a direct link to said server node and an indirect link to said server node through at least one other client node;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
implementing a process requesting updated radio transmission path data from said server node, and in response thereto, implementing by the server node changes to upgrade the selected transmission path to an optimized transmission path.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '314 Patent – Claims	Admitted Prior Art/Estoppel
	Corp. and Kahn 78 references.
12. A first node providing a gateway between two networks, where at least one of the two networks is a wireless network, said first node comprising: a radio modem capable of communicating with a first network that operates in part, by wireless communication; a network interface to communicating with a second network; a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '314 Patent – Claims	Admitted Prior Art/Estoppel
said digital controller maintaining a map of data packet transmission paths to a plurality of second nodes of said first network, where a transmission path of a second node of said first network to said first node can be through one or more of other second node of said first network;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said digital controller changes the transmission paths of each of the second nodes to optimize the transmission paths including changing each transmission path from on of the plurality of said second nodes to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '314 Patent – Claims	Admitted Prior Art/Estoppel
the fastest second nodes.	
13. A first node as recited in claim 12, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller converts data packets received from the first network and destined for the second network into a format used by the second network.	It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
14. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver implementing a process to receive a data packet from a second node of said wireless network, a first converter implementing a process to convert said data packet to a format used in said second network, and a first transmitter implementing a process to transmit said data packet to a proper location on said second network; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

The '314 Patent – Claims	Admitted Prior Art/Estoppel
a second data packet receiver implementing a process to receive a data packet from said second network, a second converter implementing a process to convert said data packet to a format used in said wireless network, and a second transmitter implementing a process to transmit said data packet with a header to a second node of said wireless network; and	
a controller implementing a process to change a transmission path to optimize a transmission path includes changing the transmission path from the second node to the first node so that the path to the first node is chosen from the group consisting essentially of the path to the first node through the least possible number of additional second nodes, the path to the first node through the most robust additional second nodes, the path to the first node through the second nodes with the least amount of traffic, and the path to the first node through the fastest second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Invalidity Chart for U.S. Patent No. 8,233,471

The '471 Patent – Claims	Admitted Prior Art/Estoppel
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '471 Patent – Claims	Admitted Prior Art/Estoppel
wherein said server process further includes logic that maintains a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

The '471 Patent – Claims	Admitted Prior Art/Estoppel
3. A wireless network system as recited in claim 2, wherein said server process further comprises: logic that compares a selected link from said client to said server to a current client link entry in said client link tree; and logic that updates said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
4. A wireless network system as recited in claim 3, wherein said server process further comprises: logic that determines if said client is authentic; logic that determines if said client is already in said client link tree if client is determined to be authentic; logic that deletes said client from said client link tree if said client is already in said client link tree; and logic that inserts said client in said client link tree if said client is authentic.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and

The '471 Patent – Claims	Admitted Prior Art/Estoppel
	maintenance of the network map, including the addition and deletion of nodes.
6. A wireless network system comprising: a server providing a server process including: receiving data packets via a server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further comprises maintaining a client link tree having client link entries	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

The '471 Patent – Claims	Admitted Prior Art/Estoppel
corresponding to an optimized transmission path for each of the plurality of clients, and	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein the server process is configured to: receive the selected transmission path from each of the plurality of clients, determine the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the optimized transmission path, and send the optimized transmission path for each of the clients to the respective clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
7. A wireless network system as recited in claim 6, wherein said server process is further configured to: compare a selected link from said	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '471 Patent – Claims	Admitted Prior Art/Estoppel
client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is already in said client link tree; and insert said client in said client link tree if said client is authentic.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. A method for providing wireless	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '471 Patent – Claims	Admitted Prior Art/Estoppel
network communication comprising: providing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and providing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein the server process: receives the selected transmission path from each of the plurality of clients determines the optimized transmission path for each of the plurality of clients based on the	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree)

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selected transmission paths received from the plurality of clients updates the client link entries to provide the optimized transmission path, and sends the optimized transmission path for each of the clients to the respective clients.	that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
11. A method as recited in claim 10, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
12. A method as recited in claim 11, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25.

The '471 Patent – Claims	Admitted Prior Art/Estoppel
determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client in said client link tree if said client is authentic.	The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
14. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
a link selection step that is one of a direct link to a server and an indirect link to said server through at least one	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

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of the remainder of said plurality of clients,	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further comprises the step of maintaining a client link tree having client link entries corresponding to an optimized transmission path for each of the plurality of clients, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein the server process: receives the selected transmission path from each of the plurality of clients, determines the optimized transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the optimized transmission path, and sends the optimized transmission	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

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path for each of the clients to the respective clients.	
15. A method as recited in claim 14, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
16. A method as recited in claim 15, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is already in said client link tree; and inserting said client into said client link tree if said client is authentic.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees

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	are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
17. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

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said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes; and	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said first node process dynamically updates a second node link tree comprising second node link entries and dynamically modifies the second node link tree so that the data packet transmission from the first node is optimized.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
18. A wireless network system as recited in claim 17, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

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second node link tree when said comparison meets predetermined conditions.	
19. A wireless network system as recited in claim 18 wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
20. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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and performing node link tree housekeeping functions; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
the first node process further comprises maintaining a second node link tree having second node link entries, dynamically updating the tree to reflect the current operational status of the nodes, and rerouting data packets around inactive or malfunctioning nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

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21. A wireless system as recited in claim 20, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
22. A wireless system as recited in claim 21, wherein the first node process further includes: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4.

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said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
31. A wireless system comprising: a first node implementing a first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, and communicating with a network; a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data buffer in a digital memory, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a link to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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the first node process further comprises maintaining a second node link tree having second node link entries.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
32. A wireless system as recited in claim 31, wherein the first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic updating said second node link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
33. A wireless system as recited in claim 32, wherein the first node process further includes:	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley

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logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; logic deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and logic inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic.	& Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
34. A method for providing wireless network communication comprising: providing a first node implementing a first node process including receiving data packets via R.F. transmission and sending data packets via R.F. transmission; providing a plurality of second nodes, each second node providing a second node process including sending and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

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receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
maintaining a second node link tree having second node link entries at the first node.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
35. A method as recited in claim 34, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
36. A method as recited in claim 34, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the

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modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	'062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
receive selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
determine an optimized transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; and send the optimized transmission path for each of the plurality of client nodes	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree)

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The '471 Patent – Claims	Admitted Prior Art/Estoppel
to the respective client node.	that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn 1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).

Invalidity Chart for U.S. Patent No. 8,625,496

The '496 Patent – Claims	Admitted Prior Art/Estoppel
1. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said server radio modem; a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
and	
wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients; determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients; send information identifying the server selected transmission path for each of the clients to the respective clients; and maintain a client link tree having client link entries representing each of the plurality of clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
2. A wireless network system comprising: a server including a server controller and a server radio modem, said server controller implementing a server process that includes the control of said server radio modem, said server process including the receipt and transmission of data packets via said	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
server radio modem; and a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes the control of said client radio modem, said client process including the receipt and transmission of data packets via said client radio modem,	references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further includes logic that maintains a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to: receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
plurality of clients based on the selected transmission paths received from the plurality of clients, and send information identifying the server selected transmission path for each of the clients to the respective clients.	
3. A wireless network system as recited in claim 2, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
4. A wireless network system as recited in claim 2, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if said client is determined to be authentic;	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
5. The wireless network system of claim 2, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
7. A wireless network system comprising: a server providing a server process including receiving data packets via a	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling

The '496 Patent – Claims	Admitted Prior Art/Estoppel
server wireless communication, sending data packets via said wireless communication, communicating with a network, and performing housekeeping functions; and a plurality of clients, each client providing a client process including sending and receiving data packet via a client wireless communication, maintaining a send/receive data buffer in digital memory, and	claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further comprises maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process is configured to:	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
receive information identifying the selected transmission path from each of the plurality of clients, determine a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, update the client link entries to provide the server selected transmission path, and send information identifying the server selected transmission path for each of the clients to the respective clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
8. A wireless network system as recited in claim 7, wherein said server process is further configured to: compare a selected link from said client to said server to a current client link entry in said client link tree; and update said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	Corp. and Kahn 78 references.
9. A wireless network system as recited in claim 7, wherein said server process is further configured to: determine if said client is authentic; determine if said client is already in said client link tree if client is determined to be authentic; delete said client from said client link tree if said client is authentic and is already in said client link tree; and insert said client in said client link tree if said client is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
10. The wireless network system of claim 7, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree)

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
11. A method for providing wireless network communication comprising: utilizing a server implementing a server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
wherein the server process: receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
maintains a client link tree having client link entries representing each of the plurality of clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
12. A method for providing wireless network communication comprising: utilizing a server implementing a	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

The '496 Patent – Claims	Admitted Prior Art/Estoppel
server process including receiving data packets via RF transmission, sending data packets via RF transmission, communicating with a network, and performing housekeeping functions; and utilizing a plurality of clients, each client providing a client process including sending and receiving data packet via RF transmission, maintaining a send/receive data buffer in digital memory, and	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further includes maintaining a client link tree having client link entries representing each of the plurality of clients, and wherein the server process:	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
13. A method as recited in claim 12, wherein said server process further includes: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	Corp. and Kahn 78 references.
14. A method as recited m claim 12, wherein said server process further includes: determining is said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client in said client link tree if said client is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
15. The method of claim 12, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree)

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
16. A method for providing wireless network communication comprising the steps of: a server process including a data packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
a transmission path selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein the server process: receives information identifying the	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, sends information identifying the server selected transmission path for each of the clients to the respective clients; and	'062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
maintains a client link tree having client link entries representing each of the plurality of clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
17. A method for providing wireless network communication comprising the steps of: a server process including a data	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
packet reception step, a data packet transmission step, a network communication step, and a housekeeping step; and a plurality of clients each providing a client process including a data sending and receiving step, a send and receive data buffer maintenance step, and	claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
a link selection step wherein the transmission path is one of a direct link to a server and an indirect link to said server through at least one of the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
wherein said server process further comprises the step of maintaining a client link tree having client link entries representing each of the plurality of clients, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein the server process:	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element.

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receives information identifying the selected transmission path from each of the plurality of clients, determines a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, updates the client link entries to provide the server selected transmission path, and sends information identifying the server selected transmission path for each of the clients to the respective clients.	The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
18. A method as recited m claim 17, wherein said server process further comprises the steps of: comparing a selected link from said client to said server to a current client link entry in said client link tree; and updating said client link tree when said comparison meets predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

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19. A method as recited in claim 17, wherein said server process further comprises steps of: determining if said client is authentic; determining if said client is already in said client link tree if client is determined to be authentic; deleting said client from said client link tree if said client is authentic and is already in said client link tree; and inserting said client into said client link tree if said client is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
20. The method of claim 17, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
21. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling of said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to said first node that is a link to said first node through at least one of the	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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remainder of said plurality of second nodes,	
wherein said first node process dynamically updates a second node link tree comprising second node link entries representing each of the plurality of second nodes and dynamically modifies the second node link tree so that the data packet transmission path to the first node is optimized.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
22. A wireless network system as recited in claim 21, wherein at least one of the second nodes is a mobile device and said first node process further comprises: logic comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and logic dynamically updating said second node link tree when said comparison meets predetermined	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

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conditions.	
23. A wireless network system as recited in claim 21, wherein said first node process further comprises: logic determining if one of the plurality of said second nodes is authentic; logic determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; and logic inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said second node link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
24. In a wireless system comprising a plurality of second nodes, each second node implementing a second node process including sending and receiving data packet via a second node wireless radio, maintaining a send/receive data	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree)

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buffer in a digital memory, and	that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a link to a first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
a first node configured to implement a first node process, the first node process including: receiving data packets via a first node wireless radio; sending data packets via said wireless radio; communicating with a network; performing node link tree housekeeping functions;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
dynamically updating the tree to reflect the current operational status of the second nodes; and rerouting data packets around inactive or malfunctioning second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
25. The first node of claim 24, wherein the first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and dynamically updating said second node link tree when said comparison	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis

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meets predetermined conditions.	Corp. and Kahn 78 references.
26. The first node of claim 24, wherein the first node process further includes: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said second node link tree if one of the plurality of said second nodes is determined to be authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node link tree if said second node is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
27. In a wireless system comprising a plurality of second nodes and a first node configured to implement a first	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

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node process, the first node process including receiving data packets via a first node wireless radio, sending data packets via said wireless radio, communicating with a network, performing node link tree housekeeping functions,	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
dynamically updating the tree to reflect the current operational status of the second nodes, and rerouting data packets around inactive or malfunctioning second nodes, a second node in the plurality of second nodes,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for

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	communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
the second node configured to implement a second node process including: sending and receiving data packet via a second node wireless radio; maintaining a send/receive data buffer in a digital memory; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a link to the first node that is one of a direct link to the first node and an indirect link to the first node through at least one of the remainder of the plurality of second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
33. In a wireless network system comprising a plurality of second nodes each including a second node controller configured to implement a second node process that includes	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem, and	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
the first node comprising: a first node controller; and a first node radio modem, wherein said first node controller is configured to implement a first node process comprising: controlling said first node radio modem; receiving and transmitting data packets via said first node radio modem; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling

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	claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
34. A wireless network system as recited in claim 33, wherein said first node process further comprises: comparing a selected link from one of the plurality of said second nodes to said first node to a current second node link entry in said second node link tree; and updating said second node link tree when said comparison meet predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
35. A wireless network system as recited in claim 33, wherein said first node process further comprises: determining if one of the plurality of said second nodes is authentic; determining if one of the plurality of said second nodes is already in said	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25.

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second node link tree if one of the plurality of said second nodes is determined to be authentic; and inserting one of the plurality of said second nodes in said second node link tree if one of the plurality of said second nodes is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and maintenance of the network map, including the addition and deletion of nodes.
36. In a wireless network system comprising a plurality of second nodes and a first node, the first node comprising a first node controller and a first node radio modem, wherein said first node controller is configured to implement a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
maintaining a second node link tree comprising second node link entries representing each of the plurality of second nodes, at least one second node in the plurality of second nodes comprising:	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

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	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
a second node controller configured to implement a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
initiating a radio transmission path to a first node that is a direct link to said first node through at least one of the remainder of said plurality of second nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
37. A method for providing wireless network communication comprising: implementing in a first node a first node process including receiving data	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling

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packets via R.F. transmission and sending data packets via R.F. transmission; implementing in each of a plurality of second nodes a second node process including sending and receiving data packet via R.F. transmission, maintaining a send/receive data buffer in digital memory, and	claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
selecting a transmission path to said first node that is one of a direct link to said first node and an indirect link to said first node through at least one of the remainder of said plurality of second nodes; and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
maintaining a second node link tree having second node link entries representing each of the plurality of second nodes at the first node.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
38. A method as recited in claim 37, wherein said first node process further includes: comparing a selected link from one of the plurality of said second nodes to said first node to a second node link entry in said second node link tree; and updating said second node link tree when said comparison meets at least one of several predetermined conditions.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
39. A method as recited in claim 37, wherein said first node process further includes: determining if one of the plurality of said second nodes is authentic; deleting one of the plurality of said second nodes from said second node link tree if one of the plurality of said second nodes is authentic and is already in said second node link tree; and inserting one of the plurality of said second nodes in said second node tree if said second node is authentic and is not already in said client link tree.	The Brownrigg patents admit that "[a]uthentication techniques are well known to those skilled in the art. For example, the book, incorporated herein by reference, Algorithms in SNOBOL 4, by James F. Gimpel, Bell Telephone Laboratories, John Wiley & Sons, a Wiley Interscience Publication, © 1976 by Bell Telephone Labs, Inc., ISBN 0-471-30213-9, describes authentication techniques using one-way seeds." '062 patent at 15:18-25. The Brownrigg patents admit that "[t]he addition and removal of nodes from trees are well known to those skilled in the art. For example, in the book, incorporated herein by reference, SNOBOL 4: Techniques and Applications, by Ralph E. Griswald, Department of Computer Science, University of Arizona, Prentiss-Hall, Inc., .COPYRGT. 1975, ISBN 0-13-853010-6, algorithms for placing and removing clients from trees are discussed." '062 patent at 14:65-15:4. At a minimum, it would have been obvious to implement authentication of clients and

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	maintenance of the network map, including the addition and deletion of nodes.
40. In a network including a plurality of client nodes having a client radio modem and a client controller which implements a client process including receiving and transmitting data packets via said client node to other nodes in the network, a server node comprising: a server node radio modem; and a server node controller implementing a server process, said server process configured to:	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
receive information identifying selected transmission paths from each of the plurality of client nodes, wherein said transmission path is one of a direct link to the server node and an indirect link to said server node through at least one other client node;	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
determine a server selected	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
transmission path for each of the plurality of client nodes based on the selected transmission paths received from the plurality of client nodes; send information identifying the server selected transmission path for each of the plurality of client nodes to the respective client node; and	The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
maintain a client link tree having client link entries representing each of the plurality of client nodes.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
41. The server node of claim 40, wherein the server process is further configured to perform gateway functions.	It would have been obvious for the server node to serve as a gateway to, e.g., the internet, so that a node could access a web server, e.g., as such was well-known in the art. Such a gateway would provide translation between the networks and appropriate formatting of packets. Various references disclose such gateways, including Kahn

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
	1978 and V. G. Cerf and P. T. Kirstein, "Issues in packet network interconnection," Proceedings of the IEEE, Vol. 66, No. 11 (Nov. 1978).
42. A server for use in a wireless network system including a plurality of clients each including a client controller and a client radio modem, said client controller implementing a client process that includes controlling said client radio modem, receiving and transmitting data packets via said client radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said client process of each of said clients initiates and selects a radio transmission path to said server that is one of a direct link to said server and an indirect link to said server through at least one the remainder of said plurality of clients,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
said server comprising: a server controller and a server radio modem, said server controller implementing a server process that includes the controlling of said server radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
receiving and transmitting of data packets via said server radio modem,	It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
maintaining a client link tree having client link entries representing each of the plurality of clients, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
receiving information identifying the selected transmission path from each of the plurality of clients, determining a server selected transmission path for each of the plurality of clients based on the selected transmission paths received from the plurality of clients, and sending information identifying the server selected transmission path for each of the clients to the respective clients.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

Exhibit B10 – Invalidity Chart for Brownrigg Family based on Admitted Prior Art/Estoppel

The '496 Patent – Claims	Admitted Prior Art/Estoppel
44. The server of claim 42, wherein the client link entries correspond to the server selected transmission path between the server and the respective client.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.
45. A first node for use in wireless network system including a plurality of second nodes each including a second node controller implementing a second node process that includes controlling a second node radio modem, receiving and transmitting data packets via said second node radio modem,	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
wherein said second node process of each of said second nodes includes initiating a radio transmission path to	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the

The '496 Patent – Claims	Admitted Prior Art/Estoppel
said first node that is a link to said first node through at least one of the remainder of said plurality of second nodes,	elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010.
said first node comprising: a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, receiving and transmitting data packets via said first node radio modem, and	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Network Analysis Corp. and Kahn 78.
dynamically updating a second node link tree comprising second node link entries representing each of the plurality of second nodes so that the data packet transmission path to the first node is optimized.	Claims 1, 5, 9, and 13 of the '062 patent included, or rendered obvious, this element. The Board of Patent Appeals and Interferences affirmed the rejection of claim 1 of the '062 patent based on prior art on November 10, 2010. Brownrigg admitted that the elements of claim 1 and 9 were not patentably distinct from the prior art by cancelling claims 1, 5, 9, and 13 of the '062 patent on December 8, 2010. It would have been obvious for a gateway node to maintain a network map (or tree) that the node could optimize the network and determine efficient routes for communications with other nodes in the network, as discussed in the other references cited by Emerson, such as Dynamic Source Routing, Network Analysis Corp. and Kahn 78 references.

Exhibit B11 – Invalidity Chart for Brownrigg Family based on Leiner Reference

The Leiner reference, Leiner et al., "Issues in Packet Radio Network Design," 75 Proceedings of the IEEE, pp. 6-20 (Jan. 1987) (Leiner), includes descriptions relating to routing in packet radio networks.

Invalidity Chart for U.S. Patent No. 6,249,516

The '516 Patent – Claims	Leiner Reference
1. A server providing a gateway between two networks, where at least one of the two networks is a wireless network, said server comprising: a radio modem capable of communicating with a first network that operates, at least in part, by wireless communication; a network interface capable of communicating with a second network; and a digital controller coupled to said radio modem and to said network interface, said digital controller communicating with said first network via said radio modem and communicating with said second network via said network interface, said digital controller passing data packets received from said first network that are destined for said	"Fig. 1 shows a typical packet radio network structure [8]. A packet radio unit consists of a radio, antenna, and digital controller. The radio provides connectivity to a number of neighboring radios, but typically is not in direct connectivity with all radios in the network. Thus the controller needs to provide for store-and-forward operation, relaying packets to accomplish connectivity between the originating and destination users." Leiner at 6. "Thus there are many design choices that must be made in the development of a packet radio network. There is usually no single correct choice, and the decisions are dependent on the environment that the network must work in, the requirements for performance and other functionalities, and the cost and other limitations. In addition, as new hardware and software technologies become available, the parameters governing the decisions change and often result in different selections." Leiner at 7. "1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological

The '516 Patent – Claims	Leiner Reference
second network to said second network, and passing data packets received from said second network that are destined for said first network to said first network,	partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22], Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
said digital controller maintaining a map of data packet transmission paths of a plurality of clients of said first network, where a transmission path of a client of said first network to said server can be through one or more of other clients of said first network;	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11.
wherein said digital controller changes the transmission paths of	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be

The '516 Patent – Claims	Leiner Reference
clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11. "The basic job of the network management algorithms is to allow data packets to be routed through the network in an efficient and reliable manner. This entails two basic tasks. The first is the establishment of routes through the network, and the second is the forwarding of packets along those routes." Leiner at 12. "Because flooding techniques do not require *a priori* knowledge of the network connectivity, they are easily used for disseminating network management and control information which is used to determine that connectivity." Leiner at 13. "Point-to-point routing methods typically involve the association of a route (a sequence of links) with a source-destination pair. One method of doing point-to-point routing is to explicitly associate information in each node with a source- destination pair (connection). Typically such techniques involve a route establishment phase that occurs when the 'connection' is first recognized, and then the information stored at each node is used to perform the actual routing of the packets. Forwarding of packets then simply involves looking up the appropriate forwarding information based on the connection identifier (which is carried in the packet). If topology changes occur, a new route establishment (or re-establishment) phase would occur to assure that the correct information is stored at all the nodes in the intended route." Leiner at 13. "Thus we see that all three routing methods have a place in packet radio networks. In relatively static networks, it is often most efficient to have the nodes determine their

The '516 Patent – Claims	Leiner Reference
	connectivity, and then determine relatively fixed routes (which would then be modified if connectivity changed due to mobility, etc.). For more dynamic networks, where connectivity is constantly changing, higher channel efficiency can be achieved by reducing the connection setups and the associated overhead. Finally, in the most dynamic networks, where network delays preclude tracking of connectivity on any but the most local basis, flooding techniques would appear to be a reasonable approach." Leiner at 13. "HOW SHOULD THE INFORMATION THAT EACH NODE REQUIRES TO ROUTE PACKETS BE DISSEMINATED TO THOSE NODES? For any type of routing method (with the exception of the most simple flooding methods), the local connectivity information must be processed and made available to the nodes so that they may route the packets. Note that this is somewhat independent of the type of routing being used. However, it does depend on the method for determining link connectivity and in particular, where the resulting connectivity information resides. A popular method for doing routing in networks where functional distribution is not needed (e.g., for survivability) is to use a centralized routing server. (This, in fact, was the method used in the early DARPA packet radio network [3].) This technique has each node send its local connectivity information to a central location. At this location, routes are determined and the information required by each node to process and forward packets (such as the next node along the route) is sent to the individual network nodes on either a request basis or as a background operation which constantly updates tables in the nodes." Leiner at 13. "Use of a centralized routing server has several advantages over more distributed techniques. Because the server has all the connectivity information available (albeit not necessarily current), it can be quite efficient in the computation of routes. This

The '516 Patent – Claims	Leiner Reference
	can be a significant advantage in packet radio situations where both connectivity and congestion are more visible globally and where some nodes are typically collocated with mobile users as opposed to being located in some predetermined location. The centralized techniques can generally be extended to a small number of servers for load-sharing and/or backup, thus overcoming some of the problems of size and robustness inherent in a centralized method." Leiner at 13. "One method for distributing the routing process is to provide enough information to each node so that each node can simply compute for itself the best total route and then take action locally that is commensurate with that global optimum. For example, based on the computed best total route, a node may determine which is the best node to forward the packet. At the next node, the route may be recomputed or the entire route (or portion) could be included in the packet. (The latter is considerably less robust in the face of changing topology.) This form of distributed routing can be accomplished by having each node transmit its local connectivity information explicitly to every other node. Typically a form of flooding is used to disseminate the information." Leiner at 13-14. "This method is quite robust (except for errors in tables or transmissions) and, in fact, is the (new) algorithm used in the Arpanet [21] and is planned for use in the gateways of the DARPA Internet system [22], [23]. However, if the network has a relatively high rate of topology changes, the amount of traffic on the network could be very high, as every substantial topology change can produce a number of packets roughly equal to the number of nodes in the network times the number of nodes directly affected by the change. Thus this method of routing is well-suited to a network like the Arpanet or a packet radio network consisting of fixed locations where topology changes are infrequent." Leiner at 14.

Exhibit B11 – Invalidity Chart for Brownrigg Family based on Leiner Reference

The '516 Patent – Claims	Leiner Reference
	"Another interesting routing structure occurs when packet radio networks are hierarchically organized. If the network is assumed to consist of clusters of packet radios that are interconnected, the topology between clusters is likely to change at a slower rate than that between radios, and therefore hierarchical techniques may be applicable. We see this applied to packet radio in [24] and [6]." Leiner at 14.
2. A server as recited in claim 1, wherein the second network is a TCP/IP protocol network.	"1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22), Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a

Exhibit B11 – Invalidity Chart for Brownrigg Family based on Leiner Reference

The '516 Patent – Claims	Leiner Reference
	single network becomes partitioned." Leiner at 17.
4. A server as recited in claim 1, wherein the digital controller translates data packets received from the second network and destined for the first network into a format used by the first network, and the digital controller translates data packets received from the first network and destined for the second network into a format used by the second network.	"1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22], Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
5. A server as recited in claim 2:	"1) Gateways: Gateways can perform many functions but, as far as addressing is

The '516 Patent – Claims	Leiner Reference
wherein the digital controller receives data packets from the TCP/IP protocol network destined for a client of the first network, adds a header that includes an address of the client of the first network and a data transmission path to the client of the first network, adds a indicator of the type of data associated with the packet, and transmits the packet via the radio modem with the header and the indicator; and wherein the digital controller receives data packets from the first network destined for the TCP/IP protocol network, converts the data packets into TCP/IP format, and sends the TCP/IP format data packet to an IP address on the TCP/IP protocol network.	concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22], Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
10. A method providing a gateway between a wireless network and a second network comprising: receiving a data packet from a client of said wireless network, converting	"Fig. 1 shows a typical packet radio network structure [8]. A packet radio unit consists of a radio, antenna, and digital controller. The radio provides connectivity to a number of neighboring radios, but typically is not in direct connectivity with all radios in the network. Thus the controller needs to provide for store-and-forward operation, relaying packets to accomplish connectivity between the originating and

Exhibit B11 – Invalidity Chart for Brownrigg Family based on Leiner Reference

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said data packet to a proper format for said second network, and sending said data packet to said second network; and receiving a data packet from said second network, adding a header to said packet including a reverse link and a data packet type if said data packet is destined for a client of said wireless network, said reverse link being one of a direct link to said client and an indirect link to said client through one or more other clients of said network, and transmitting said data packet with said header; and	destination users." Leiner at 6. "Thus there are many design choices that must be made in the development of a packet radio network. There is usually no single correct choice, and the decisions are dependent on the environment that the network must work in, the requirements for performance and other functionalities, and the cost and other limitations. In addition, as new hardware and software technologies become available, the parameters governing the decisions change and often result in different selections." Leiner at 7. "1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22], Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means

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	to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
changing transmission paths of clients to optimize the transmission paths including changing the transmission path from the client to the gateway so that the path to the gateway is chosen from the group consisting essentially of the path to the gateway through the least possible number of additional clients, the path to the gateway through the most robust additional clients, the path to the gateway through the clients with the least amount of traffic, and the path to the gateway through the fastest clients.	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11. "The basic job of the network management algorithms is to allow data packets to be routed through the network in an efficient and reliable manner. This entails two basic tasks. The first is the establishment of routes through the network, and the second is the forwarding of packets along those routes." Leiner at 12. "Because flooding techniques do not require *a priori* knowledge of the network connectivity, they are easily used for disseminating network management and control information which is used to determine that connectivity." Leiner at 13. "Point-to-point routing methods typically involve the association of a route (a sequence of links) with a source-destination pair. One method of doing point-to-point routing is to explicitly associate information in each node with a source- destination pair (connection). Typically such techniques involve a route establishment phase that occurs when the 'connection' is first recognized, and then the information stored at each node is used to perform the actual routing of the packets. Forwarding of packets then simply involves looking up the appropriate forwarding information based on the

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	connection identifier (which is carried in the packet). If topology changes occur, a new route establishment (or re-establishment) phase would occur to assure that the correct information is stored at all the nodes in the intended route." Leiner at 13. "Thus we see that all three routing methods have a place in packet radio networks. In relatively static networks, it is often most efficient to have the nodes determine their connectivity, and then determine relatively fixed routes (which would then be modified if connectivity changed due to mobility, etc.). For more dynamic networks, where connectivity is constantly changing, higher channel efficiency can be achieved by reducing the connection setups and the associated overhead. Finally, in the most dynamic networks, where network delays preclude tracking of connectivity on any but the most local basis, flooding techniques would appear to be a reasonable approach." Leiner at 13. "HOW SHOULD THE INFORMATION THAT EACH NODE REQUIRES TO ROUTE PACKETS BE DISSEMINATED TO THOSE NODES? For any type of routing method (with the exception of the most simple flooding methods), the local connectivity information must be processed and made available to the nodes so that they may route the packets. Note that this is somewhat independent of the type of routing being used. However, it does depend on the method for determining link connectivity and in particular, where the resulting connectivity information resides. A popular method for doing routing in networks where functional distribution is not needed (e.g., for survivability) is to use a centralized routing server. (This, in fact, was the method used in the early DARPA packet radio network [3].) This technique has each node send its local connectivity information to a central location. At this location, routes are determined and the information required by each node to process and forward packets (such as the next node along the route) is sent to the individual

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	network nodes on either a request basis or as a background operation which constantly updates tables in the nodes." Leiner at 13. "Use of a centralized routing server has several advantages over more distributed techniques. Because the server has all the connectivity information available (albeit not necessarily current), it can be quite efficient in the computation of routes. This can be a significant advantage in packet radio situations where both connectivity and congestion are more visible globally and where some nodes are typically collocated with mobile users as opposed to being located in some predetermined location. The centralized techniques can generally be extended to a small number of servers for load-sharing and/or backup, thus overcoming some of the problems of size and robustness inherent in a centralized method." Leiner at 13. "One method for distributing the routing process is to provide enough information to each node so that each node can simply compute for itself the best total route and then take action locally that is commensurate with that global optimum. For example, based on the computed best total route, a node may determine which is the best node to forward the packet. At the next node, the route may be recomputed or the entire route (or portion) could be included in the packet. (The latter is considerably less robust in the face of changing topology.) This form of distributed routing can be accomplished by having each node transmit its local connectivity information explicitly to every other node. Typically a form of flooding is used to disseminate the information." Leiner at 13-14. "This method is quite robust (except for errors in tables or transmissions) and, in fact, is the (new) algorithm used in the Arpanet [21] and is planned for use in the gateways of the DARPA Internet system [22], [23]. However, if the network has a relatively high rate of topology changes, the amount of traffic on the network could be very high, as

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	every substantial topology change can produce a number of packets roughly equal to the number of nodes in the network times the number of nodes directly affected by the change. Thus this method of routing is well-suited to a network like the Arpanet or a packet radio network consisting of fixed locations where topology changes are infrequent." Leiner at 14. "Another interesting routing structure occurs when packet radio networks are hierarchically organized. If the network is assumed to consist of clusters of packet radios that are interconnected, the topology between clusters is likely to change at a slower rate than that between radios, and therefore hierarchical techniques may be applicable. We see this applied to packet radio in [24] and [6]." Leiner at 14.
11. A method as recited in claim 10: wherein the second network is a TCP/IP protocol network; wherein the data packet received from a client of a wireless network is converted to a TCP/IP format if it is destined for an IP address on a TCP/IP protocol network, and the TCP/IP format data packet is sent to the IP address on the TCP/IP protocol network; and wherein the data packet received from the second network is received from the TCP/IP protocol network.	"1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22), Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single

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	network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
13. A method as recited in claim 10 further comprising maintaining a map of data packet transmission paths of a plurality of clients of the wireless network, where a transmission path of a client of the wireless network to the server can be through one or more other clients of the first network.	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11.
14. A method as recited in claim 13, further comprising dynamically updating the map of data packet transmission paths to optimize the data packet transmission paths of the clients.	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11.

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	"The basic job of the network management algorithms is to allow data packets to be routed through the network in an efficient and reliable manner. This entails two basic tasks. The first is the establishment of routes through the network, and the second is the forwarding of packets along those routes." Leiner at 12. "Because flooding techniques do not require *a priori* knowledge of the network connectivity, they are easily used for disseminating network management and control information which is used to determine that connectivity." Leiner at 13. "Point-to-point routing methods typically involve the association of a route (a sequence of links) with a source-destination pair. One method of doing point-to-point routing is to explicitly associate information in each node with a source- destination pair (connection). Typically such techniques involve a route establishment phase that occurs when the 'connection' is first recognized, and then the information stored at each node is used to perform the actual routing of the packets. Forwarding of packets then simply involves looking up the appropriate forwarding information based on the connection identifier (which is carried in the packet). If topology changes occur, a new route establishment (or re-establishment) phase would occur to assure that the correct information is stored at all the nodes in the intended route." Leiner at 13. "Thus we see that all three routing methods have a place in packet radio networks. In relatively static networks, it is often most efficient to have the nodes determine their connectivity, and then determine relatively fixed routes (which would then be modified if connectivity changed due to mobility, etc.). For more dynamic networks, where connectivity is constantly changing, higher channel efficiency can be achieved by reducing the connection setups and the associated overhead. Finally, in the most dynamic networks, where network delays preclude tracking of connectivity on any but the most local basis, flooding techniques would appear to be a reasonable

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	approach." Leiner at 13. "HOW SHOULD THE INFORMATION THAT EACH NODE REQUIRES TO ROUTE PACKETS BE DISSEMINATED TO THOSE NODES? For any type of routing method (with the exception of the most simple flooding methods), the local connectivity information must be processed and made available to the nodes so that they may route the packets. Note that this is somewhat independent of the type of routing being used. However, it does depend on the method for determining link connectivity and in particular, where the resulting connectivity information resides. A popular method for doing routing in networks where functional distribution is not needed (e.g., for survivability) is to use a centralized routing server. (This, in fact, was the method used in the early DARPA packet radio network [3].) This technique has each node send its local connectivity information to a central location. At this location, routes are determined and the information required by each node to process and forward packets (such as the next node along the route) is sent to the individual network nodes on either a request basis or as a background operation which constantly updates tables in the nodes." Leiner at 13. "Use of a centralized routing server has several advantages over more distributed techniques. Because the server has all the connectivity information available (albeit not necessarily current), it can be quite efficient in the computation of routes. This can be a significant advantage in packet radio situations where both connectivity and congestion are more visible globally and where some nodes are typically collocated with mobile users as opposed to being located in some predetermined location. The centralized techniques can generally be extended to a small number of servers for load-sharing and/or backup, thus overcoming some of the problems of size and robustness inherent in a centralized method." Leiner at 13.

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	"One method for distributing the routing process is to provide enough information to each node so that each node can simply compute for itself the best total route and then take action locally that is commensurate with that global optimum. For example, based on the computed best total route, a node may determine which is the best node to forward the packet. At the next node, the route may be recomputed or the entire route (or portion) could be included in the packet. (The latter is considerably less robust in the face of changing topology.) This form of distributed routing can be accomplished by having each node transmit its local connectivity information explicitly to every other node. Typically a form of flooding is used to disseminate the information." Leiner at 13-14. "This method is quite robust (except for errors in tables or transmissions) and, in fact, is the (new) algorithm used in the Arpanet [21] and is planned for use in the gateways of the DARPA Internet system [22], [23]. However, if the network has a relatively high rate of topology changes, the amount of traffic on the network could be very high, as every substantial topology change can produce a number of packets roughly equal to the number of nodes in the network times the number of nodes directly affected by the change. Thus this method of routing is well-suited to a network like the Arpanet or a packet radio network consisting of fixed locations where topology changes are infrequent." Leiner at 14. "Another interesting routing structure occurs when packet radio networks are hierarchically organized. If the network is assumed to consist of clusters of packet radios that are interconnected, the topology between clusters is likely to change at a slower rate than that between radios, and therefore hierarchical techniques may be applicable. We see this applied to packet radio in [24] and [6]." Leiner at 14.

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Invalidity Chart for U.S. Patent No. 8,000,314

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1. A wireless network system comprising: a first node including a first node controller and a first node radio modem, said first node controller implementing a first node process that includes controlling said first node radio modem, said first node process including receiving and transmitting data packets via said first node radio modem; a plurality of second nodes each including a second node controller and a second node radio modem, said second node controller implementing a second node process that includes controlling of said second node radio modem, said second node process including receiving and transmitting data packets via said second node radio modem,	"Fig. 1 shows a typical packet radio network structure [8]. A packet radio unit consists of a radio, antenna, and digital controller. The radio provides connectivity to a number of neighboring radios, but typically is not in direct connectivity with all radios in the network. Thus the controller needs to provide for store-and-forward operation, relaying packets to accomplish connectivity between the originating and destination users." Leiner at 6. "Thus there are many design choices that must be made in the development of a packet radio network. There is usually no single correct choice, and the decisions are dependent on the environment that the network must work in, the requirements for performance and other functionalities, and the cost and other limitations. In addition, as new hardware and software technologies become available, the parameters governing the decisions change and often result in different selections." Leiner at 7. "1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22), Whenever gateways play important roles such as this in mobile packet radio networks, the following issue

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	arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
wherein said second node process of each of said second nodes includes selecting a radio transmission path to said first node that is direct or through at least one of the remainder of said plurality of second nodes; and	"In the section above on data link control, the tradeoff between the various link parameters was discussed. In addition, there must be an interaction between network level routing algorithms (discussed below) and the control of the link parameters [20]. If link connectivity is lost, the network must determine whether it should try harder on that link (by, for example, increasing power or coding gain) or it should attempt to find a different route, thereby possibly suffering some delay and lost packets while the new route is determined." Leiner at 12. "One method for distributing the routing process is to provide enough information to each node so that each node can simply compute for itself the best total route and then take action locally that is commensurate with that global optimum. For example, based on the computed best total route, a node may determine which is the best node to forward the packet. At the next node, the route may be recomputed or the entire route (or portion) could be included in the packet. (The latter is considerably less robust in the face of changing topology.) This form of distributed routing can be accomplished by having each node transmit its local connectivity information explicitly to every other node. Typically a form of flooding is used to disseminate the

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	information." Leiner at 13-14.
wherein said selected path to said first node utilizes the least number of other second nodes, such that said transmission path from each of said second nodes to said first node is optimized and the first node controller implements changes to upgrade the selected transmission path in response to a request from at least one of said second nodes.	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11. "The basic job of the network management algorithms is to allow data packets to be routed through the network in an efficient and reliable manner. This entails two basic tasks. The first is the establishment of routes through the network, and the second is the forwarding of packets along those routes." Leiner at 12. "Because flooding techniques do not require *a priori* knowledge of the network connectivity, they are easily used for disseminating network management and control information which is used to determine that connectivity." Leiner at 13. "Point-to-point routing methods typically involve the association of a route (a sequence of links) with a source-destination pair. One method of doing point-to-point routing is to explicitly associate information in each node with a source- destination pair (connection). Typically such techniques involve a route establishment phase that occurs when the 'connection' is first recognized, and then the information stored at each node is used to perform the actual routing of the packets. Forwarding of packets then simply involves looking up the appropriate forwarding information based on the connection identifier (which is carried in the packet). If topology changes occur, a new route establishment (or re-establishment) phase would occur to assure that the

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	correct information is stored at all the nodes in the intended route." Leiner at 13. "Thus we see that all three routing methods have a place in packet radio networks. In relatively static networks, it is often most efficient to have the nodes determine their connectivity, and then determine relatively fixed routes (which would then be modified if connectivity changed due to mobility, etc.). For more dynamic networks, where connectivity is constantly changing, higher channel efficiency can be achieved by reducing the connection setups and the associated overhead. Finally, in the most dynamic networks, where network delays preclude tracking of connectivity on any but the most local basis, flooding techniques would appear to be a reasonable approach." Leiner at 13. "HOW SHOULD THE INFORMATION THAT EACH NODE REQUIRES TO ROUTE PACKETS BE DISSEMINATED TO THOSE NODES? For any type of routing method (with the exception of the most simple flooding methods), the local connectivity information must be processed and made available to the nodes so that they may route the packets. Note that this is somewhat independent of the type of routing being used. However, it does depend on the method for determining link connectivity and in particular, where the resulting connectivity information resides. A popular method for doing routing in networks where functional distribution is not needed (e.g., for survivability) is to use a centralized routing server. (This, in fact, was the method used in the early DARPA packet radio network [3].) This technique has each node send its local connectivity information to a central location. At this location, routes are determined and the information required by each node to process and forward packets (such as the next node along the route) is sent to the individual network nodes on either a request basis or as a background operation which constantly updates tables in the nodes." Leiner at 13.

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	"Use of a centralized routing server has several advantages over more distributed techniques. Because the server has all the connectivity information available (albeit not necessarily current), it can be quite efficient in the computation of routes. This can be a significant advantage in packet radio situations where both connectivity and congestion are more visible globally and where some nodes are typically collocated with mobile users as opposed to being located in some predetermined location. The centralized techniques can generally be extended to a small number of servers for load-sharing and/or backup, thus overcoming some of the problems of size and robustness inherent in a centralized method." Leiner at 13. "One method for distributing the routing process is to provide enough information to each node so that each node can simply compute for itself the best total route and then take action locally that is commensurate with that global optimum. For example, based on the computed best total route, a node may determine which is the best node to forward the packet. At the next node, the route may be recomputed or the entire route (or portion) could be included in the packet. (The latter is considerably less robust in the face of changing topology.) This form of distributed routing can be accomplished by having each node transmit its local connectivity information explicitly to every other node. Typically a form of flooding is used to disseminate the information." Leiner at 13-14. "This method is quite robust (except for errors in tables or transmissions) and, in fact, is the (new) algorithm used in the Arpanet [21] and is planned for use in the gateways of the DARPA Internet system [22], [23]. However, if the network has a relatively high rate of topology changes, the amount of traffic on the network could be very high, as every substantial topology change can produce a number of packets roughly equal to the number of nodes in the network times the number of nodes directly affected by

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4. A first node providing a gateway between a wireless network and a second network, the first node comprising: a first data packet receiver configured to receive a data packet from a second node of said wireless network, a first converter configured to convert the data packet to a format used in said second network, and a data packet sender configured to send the data packet to a proper location on said second network; and a second data packet receiver configured to receive the data packet from said second network, a second converter configured to convert the	"Fig. 1 shows a typical packet radio network structure [8]. A packet radio unit consists of a radio, antenna, and digital controller. The radio provides connectivity to a number of neighboring radios, but typically is not in direct connectivity with all radios in the network. Thus the controller needs to provide for store-and-forward operation, relaying packets to accomplish connectivity between the originating and destination users." Leiner at 6. "Thus there are many design choices that must be made in the development of a packet radio network. There is usually no single correct choice, and the decisions are dependent on the environment that the network must work in, the requirements for performance and other functionalities, and the cost and other limitations. In addition, as new hardware and software technologies become available, the parameters governing the decisions change and often result in different selections." Leiner at 7. "1) Gateways: Gateways can perform many functions but, as far as addressing is concerned, they are packet translation devices that interpret addresses at the internet level and impose headers (addresses) appropriate both to the local networks to

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data packet to a format used in said wireless network, and a data packet sender configured to send said data packet with a header to a second node of said wireless network; and	which they are attached as well as other networks. They are host-level devices and to work correctly must have some relationship with not only the other gateways of the internet but the network-attached hosts themselves. Gateways may have an additional role in highly mobile networks such as packet radio where topological partitioning may occur dynamically. Under these circumstances, the gateways, normally internet devices, may take on a role of intranetwork addressing and routing. Specifically, the internet may become the trajectory over which an intranet packet gets delivered when a single network temporarily divides [22), Whenever gateways play important roles such as this in mobile packet radio networks, the following issue arises: SHOULD ADDRESSING AND ROUTING BE NETWORK- OR GATEWAY-BASED? Network-based addressing means that each network has a unique name and address of which all relevant gateways are aware. In this case, all points within a single network share some portion of their address in common. In contrast, if gateway-based addressing is used, then internet packets are routed from gateway to gateway and each gateway attached to a network must have some means to route packets to destinations within that network. Furthermore, in this case, hosts must have a means to bind themselves dynamically to at least one gateway. Gateway-based routing, while somewhat less intuitive, provides a solution to the problem of what to do when a single network becomes partitioned." Leiner at 17.
a controller configured to implement changes to a transmission path from the second node to the first node based upon viable network paths observed by the second node so that the path to the first node is chosen from the group consisting essentially of the path to first node through the	"Radio connectivity must be determined by the two ends of the radio link (i.e., the two packet radio units which are connected). The information from each node can be collected at a central location where connectivity is then determined, or it can be determined by the nodes themselves through a cooperative mechanism, such as exchange of the number of transmitted and received packets. In either case, a decision must be made as to the nature of the information that will be used to determine the existence of a link." Leiner at 11.